LN 32t engng

Technical Paper 344

DEPARTMENT OF THE INTERIOR
HUBERT WORK, SECRETARY

BUREAU OF MINES
H. FOSTER BAIN, DIRECTOR

ANALYSES OF OHIO COALS

UNIVERSITY OF ILLINOIS LIBRARY
DEC 31 [illegible]

WASHINGTON
GOVERNMENT PRINTING OFFICE
1923

The Bureau of Mines, in carrying out one of the provisions of its organic act—to disseminate information concerning investigations made—prints a limited free edition of each of its publications.

When this edition is exhausted, copies may be obtained at cost price only through the Superintendent of Documents, Government Printing Office, Washington, D. C.

The Superintendent of Documents *is not an official of the Bureau of Mines.* His is an entirely separate office, and he should be addressed:

SUPERINTENDENT OF DOCUMENTS,
Government Printing Office,
Washington, D. C.

The general law under which publications are distributed prohibits the giving of more than one copy of a publication to one person. The price of this publication is 5 cents.

First edition. December, 1923.

CONTENTS.

Page.
Preface v
The coal fields of Ohio 1
  Geographic and geologic relations 1
  Coal-bearing formations 2
  Geologic structure 4
  Character of the coal 4
  Mine development 4
Mining and transportation 6
  Mining methods 6
  Transportation 6
  Markets 6
Analyses of mine and car samples 7
  Classification of analyses 7
  Sources of information 7
  Peat deposits 8
  Fusibility of coal ash 9
  Description of samples from Laughlin mine, Belmont County 33
Analyses of delivered coal 36
  Introduction 36
Bibliography 40

TABLES.

TABLE 1. Coal production, number of employees, days worked, and value per ton, by counties, for the year 1918 5
2. Chemical analyses of mine samples 10
3. Analyses of peat 34
4. Analysis of delivered coal 39

ILLUSTRATIONS.

FIGURE 1. Sketch map of Ohio showing extent of coal fields and principal coal-producing districts 2
2. Geologic section showing coal beds in Ohio 3

Original from UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

PREFACE.

One of the important functions of the Bureau of Mines has been the analyzing of samples of coal from every coal-mining State and from Alaska. The analyses are being published for the information of Government officials and the public.

These samples have been collected in mines by representatives of the Bureau of Mines and by geologists of the United States Geological Survey in investigations of mineral resources; they have been collected from coal delivered for the use of Government Departments—Treasury, Navy, and War—and for various Government institutions; they have also come from coal obtained for tests by the bureau in investigating the utilization of fuel and the explosibility of coal dust. Many samples have been collected and analyzed in connection with the work of various State geological surveys.

From time to time the bureau has published the analytical results in large bulletins. Although the analyses in any one bulletin are grouped together by States, or by special uses, to look up the analyses of coals from any particular section of the country necessitates the perusal of a number of bulletins, some of which are no longer available for free distribution.

Moreover, when the bureau receives an inquiry for analyses of coal from any desired part of the country, it constitutes a large wastage of printed documents to send a number of bulletins in order to show the analyses for only one mining district in a State, or even for an individual mine. It therefore is deemed expedient to republish the analyses of coal in a series of inexpensive publications, by separate States, or if the coal production is small in any State, by adjacent States, and to include a brief description, abstracted from the reports of the United States Geological Survey, of the geologic structure of the coal basins in the State, or group of States, as well as a brief description of the typical mining conditions in the different districts, and a statement of the production by counties as compiled by the United States Geological Survey.

Technical paper 269 was the first of the series to be issued; this paper on Ohio coals is the third. From time to time the various papers will be revised to include later analyses.

H. Foster Bain,
Director.

THE COAL FIELDS OF OHIO.

By M. R. Campbell.[1]

GEOGRAPHIC AND GEOLOGIC RELATIONS.

The coal fields of Ohio occupy the southeastern part of the State in a belt of country that extends from Youngstown on the north to Ohio River in the extreme south of the State. From New Philadelphia to Zanesville the coal fields have a width of about 70 miles, but toward each extremity they narrow to about half as much.

The surface is generally hilly; it was, in fact, originally a plateau of moderate height in which the streams have since cut valleys 10 to 500 feet deep. These valleys, particularly in the vicinity of the principal rivers, are generally narrow, and their sides are so steep that they are farmed with difficulty or remain forest covered. Each of the side streams has cut a valley similar to that of the parent stream, so that little remains of the level land that once constituted the surface of the plateau. Toward the heads of the streams the plateau is less dissected, and here the land is nearly all under cultivation; but lower down the streams the valleys are generally so narrow that they can not be utilized as farm land, and hence they serve mostly as avenues of transportation.

Most of the streams now tributary to the Ohio River once flowed north or west, but in the ice age their outlets were blocked by the great ice sheets that came down from the north and the waters were deeply ponded. In the stagnant water thus produced silts accumulated that partly or completely filled the original valleys. During the ponding the streams found outlets to the south; these were maintained after the barrier of ice had melted and persist to the present time. The valleys that were silted up are to-day broad, smooth-bottomed, and swampy, and present a striking contrast to the sharp, narrow valleys of the streams draining into the Ohio.

Ohio River is the natural outlet for the coal from the mines in a large part of the fields, and it is to be hoped that now, with locks and dams that insure slack-water navigation, much of the coal produced will be sent to market by way of this stream. Despite their hilly topography, however, the coal fields are crossed by many trunk lines of railroads which have branches ramifying side valleys to the centers of coal production, and the bulk of the output is carried to consumers over these lines.

---

[1] Geologist, U. S. Geological Survey.

Figure 1, taken from a map of the United States Geological Survey, shows the extent of the coal fields and the chief producing districts.

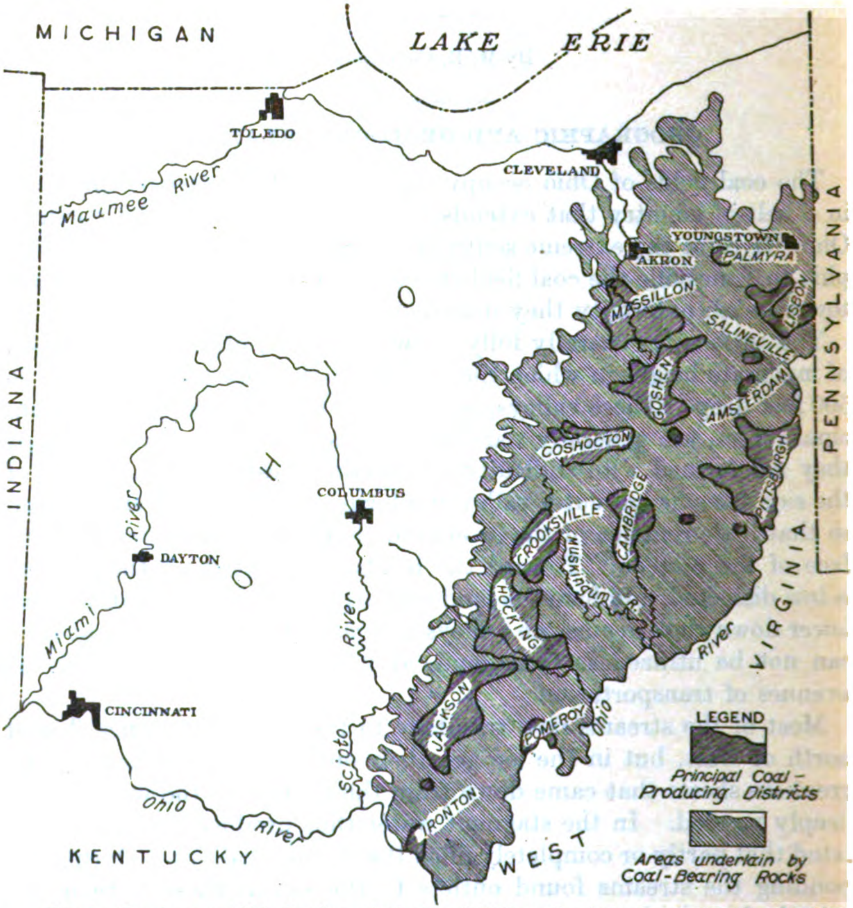

FIG. 1.—Sketch map of Ohio showing extent of coal fields and principal coal-producing districts. (After U. S. Geological Survey.)

COAL-BEARING FORMATIONS.

The coal-bearing formations differ in thickness. In their proper sequence from top to bottom they are as follows:

Coal-bearing formations of Ohio.

	Feet.
Dunkard group	630
Greene formation.	
Washington formation.	
Monongahela formation	200
Conemaugh formation	470
Allegheny formation	250
Pottsville formation	250

The important coal beds are not regularly distributed throughout these formations, but are largely limited to the Monongahela and Allegheny formations. This segregation of the coal beds is so marked that in all of the earlier geological reports these formations were called the "Upper Productive" and "Lower Productive" measures, respectively.

Figure 2 shows the vertical distribution of the coal bed in the various formations. In most of the State reports the coal beds were indicated by numbers, beginning with the Sharon coal bed at the bottom as No. 1 and extending up to the Pomeroy coal bed as No. 8a, but these numbers have been generally abandoned, and names, such as Middle Kittanning and Pittsburgh, have been substituted. In Figure 2 both numbers and names are given, as far as numbers have been applied. Some of the names, such as Pomeroy and Meigs Creek, are of local origin, but most of the names used in the Ohio field were carried over from Pennsylvania as soon as the equivalency of the beds in the two States had been established.

The most important coal bed in Ohio is doubtless the Middle Kittanning, which has made the Hocking Valley famous throughout the country on account of the quality of the coal produced there. The Pittsburgh coal bed is probably a close second and is mined extensively in Belmont and Jefferson Counties. Other beds have attained prominence in local fields, but the two mentioned above must be regarded as furnishing the bulk of the coal produced in Ohio.

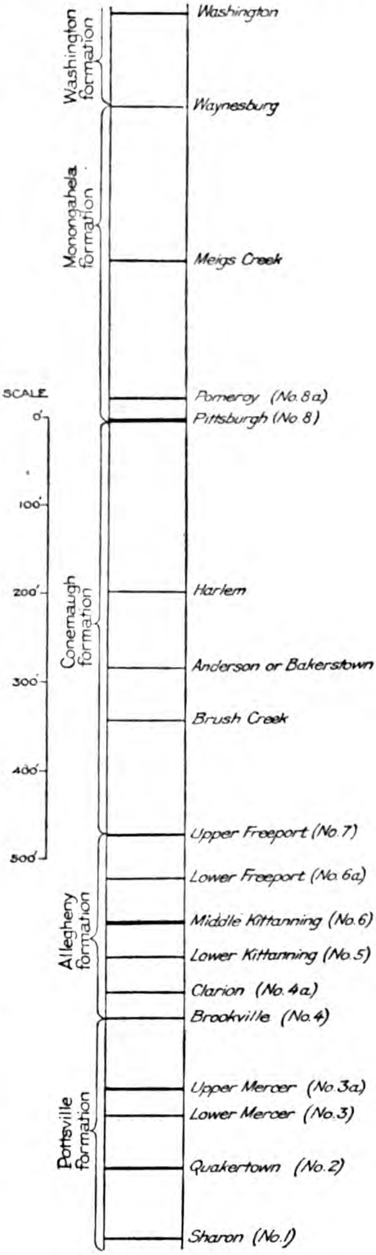

FIG. 2.—Coal beds in Ohio.

GEOLOGIC STRUCTURE.

The Ohio coal fields occupy the western rim of the great structural trough of coal-bearing rocks that extend throughout the Appalachian region from northern Pennsylvania to central Alabama. Being situated on the west side of this trough, the beds naturally dip to the east or southeast toward its axis or lowest line which lies in Pennsylvania and West Virginia and passes a short distance east of Wheeling. The lowest and oldest coal beds, therefore, outcrop near the western margin of the fields and the higher beds appear in regular order eastward, the Pomeroy and Meigs Creek coal beds outcropping close to Ohio River between Pomeroy and Bellaire. As the southeastward dip is only about 100 feet to the mile, it does not interfere with mining operations, but on the other hand is an advantage, as it makes possible, in well-arranged mines, the drainage of the workings and the delivery of the coal at the mine mouth by gravity.

CHARACTER OF THE COAL.

As the coal of the Appalachian region has doubtless all been derived from vegetation growing in swamps, the present diversity in character must be due to some process that has taken place since trees and other plants growing in the swamps were covered with earthy material and inclosed in the crust of the earth. The main agents of change have been heat and pressure and, in general, the heat has been a direct result of the pressure of the overlying mass of rocks or of compressive stresses that have affected the earth's crust and have found expression in many places in folded or faulted rocks. As the great thrust came from the southeast it affected more profoundly the coals on the east side of the great trough than it did those on the west side, and consequently those on the east side are most changed. The change is manifested by a marked loss of volatile matter and an increase of fixed carbon. This is the reason why the Ohio coals are inferior to those of West Virginia and Pennsylvania. Thus the Pittsburgh coal, which at Martins Ferry carries 48.0 per cent of fixed carbon and has a heating value of about 12,900 B. t. u., at Uniontown, Pa., shows 54.8 per cent of fixed carbon and has a heating value of 13,300 B. t. u., and at Frostburg, Md., 75.6 per cent fixed carbon and 14,100 B. t. u. The change is not noticeable within the State of Ohio, but seems to occur largely east of Ohio River.

MINE DEVELOPMENT.

The great majority of the coal mines in Ohio are under relatively shallow cover. Drift openings predominate, but there are a few shafts and slopes. Within recent years stripping operations have become an important factor in coal mining in the northern and eastern districts.

The production by counties, number of employees, the average number of days worked, and the average value per ton at the mine for the year 1918 are given in Table 1.[2]

TABLE I.—*Coal production, number of employees, days worked, and value per ton, by counties, for the year 1918.*

County.	Production, net tons.	Number of employees.			Average number of days worked.	Average value per ton.
		Under-ground.	Surface.	Total.		
Athens	6,629,564	6,671	1,002	7,673	217	$2.56
Belmont	11,852,508	9,545	1,619	11,164	223	2.47
Carroll	451,024	554	83	637	238	2.68
Columbiana	673,271	686	181	867	252	3.05
Coshocton	351,872	458	125	583	218	2.80
Gallia and Morgan	395,444	370	46	416	232	2.60
Guernsey	4,298,812	3,726	456	4,182	219	2.53
Harrison	2,070,414	949	775	1,724	239	2.44
Hocking	2,083,928	1,977	373	2,350	217	2.50
Holmes	3,400	6	....	6	242	2.19
Jackson	836,710	1,167	302	1,469	210	3.20
Jefferson	6,689,936	4,151	1,338	5,489	244	2.53
Lawrence	273,147	372	83	455	242	2.94
Mahoning	34,451	58	10	68	237	3.51
Medina	7,353	18	1	19	292	4.27
Meigs	1,299,044	1,464	296	1,760	229	2.75
Muskingum	573,836	607	152	759	208	2.52
Noble	986,189	776	57	833	237	2.67
Perry	3,116,432	3,041	764	3,805	197	2.59
Portage	140,303	176	42	218	272	3.50
Stark	533,591	614	151	765	230	3.32
Summit	81,178	89	12	101	226	2.82
Tuscarawas	1,939,928	1,982	581	2,563	217	2.75
Vinton	239,123	343	96	439	215	3.10
Wayne	25,683	83	22	105	97	3.63
Small mines	225,802	....	....	....	....	2.25
	45,812,943	39,883	8,567	48.450	223	2.58

---

[2] Lesher, C. E., Coal in 1918: Mineral resources of the United States, Part II, U. S. Geol. Survey, 1921.

MINING AND TRANSPORTATION.

By J. W. Paul.

MINING METHODS.

The methods of mining the different beds of coal in the State of Ohio are, in general, the same throughout the different coal-producing counties and consist mainly of the room and pillar plan. In a few mines the rooms are driven in panels.

Because of the practice of not removing the room pillars the percentage of recovery of coal in Ohio has not been much over 50 to 60 per cent. The practice has been to leave the pillars as long wedges, widest near the mouths of the rooms and gradually narrowing toward their faces.

In the Steubenville district the Freeport coal has been successfully mined by the long-wall method.

TRANSPORTATION.

· The coal fields of Ohio are well served by a number of railroads. The State is traversed by the main and many branch lines of the Pennsylvania Railroad system; the Baltimore & Ohio; the New York Central; Detroit, Toledo & Ironton; Hocking Valley, Toledo & Ohio Central; and Wheeling & Lake Erie. The Ohio River affords water transportation for some mines along its course, but the amount thus shipped is only a small part of the output of the State

MARKETS.

There are two principal fields in the State—the northern, which produces about 65 to 70 per cent, and the southern, producing about 30 to 35 per cent of the State's total.

About 40 to 43 per cent of the total output of the mines is consumed within the State; 5 to 9 per cent is shipped to other States; and 48 to 55 per cent embraces the tonnage delivered to railroads, exported by rail, or shipped to tidewater and to the Great Lakes for cargo.

Although the mines ship a large tonnage to other States, Ohio receives so much coal from other States that the consumption within the State, exclusive of railroad fuel, is equal to the annual production.

ANALYSES OF MINE AND CAR SAMPLES.

By A. C. Fieldner,[3] H. M. Cooper,[4] and F. D. Osgood.[5]

CLASSIFICATION OF ANALYSES.

The coal analyses in Table 1 are arranged in geographical order by counties and towns. The analyses are grouped as follows:

1. The proximate analysis, which includes results of determination of moisture, volatile matter, fixed carbon, and ash.
2. The ultimate analysis, which includes results of determinations of carbon, hydrogen, nitrogen, oxygen, sulphur, and ash.
3. The calorific value or heat of combustion.
4. The softening temperature of ash, when such determinations have been made.

Where an ultimate analysis is listed, it is given for three conditions: (1) As received; (2) computed to a moisture-free condition; (3) computed to a moisture and ash-free condition. Samples for which only the proximate analysis and heating value are given are listed only for the "as received" and "moisture-free" condition.

The analysis of the sample as received (condition 1) represents the actual sample as received at the laboratory, and for a mine-face sample it represents the coal at the actual place of sampling in the mine. The moisture-free analysis represents the relative composition and heating value of the dry coal; this form of analysis is valuable for comparing similar coals of variable moisture content. The moisture and ash-free analysis represents approximately the relative composition and calorific value of the dry combustible matter; this form is convenient for comparing coals that do not differ much in the character and amount of ash and sulphur, as in such coals the various constituents and the heating value are fairly constant for each coal bed or class of coal.

SOURCES OF INFORMATION.

Table 2 contains the chemical analyses of coals from commercial mines and prospects, collected at various times in the course of systematic surveys of the coal resources of the State, by geologists of the United States Geological Survey, inspectors of the Bureau of Mines, and geologists of the Ohio Geological Survey. The analyses

---

[3] Supervising fuels chemist, Bureau of Mines.

[4] Chemist, Bureau of Mines.

[5] Assistant chemist, Bureau of Mines.

Original from UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

have been copied from various published reports of the Bureau of Mines, United States Geological Survey, and the Ohio Geological Survey; they include all analyses made prior to July 1, 1922.

The analyses and calorimetric determinations were made in the laboratories of the organizations named. The methods used were those approved by the United States Geological Survey and the Bureau of Mines,[6] and adopted by the American Chemical Society and American Society for Testing Materials as standard methods for coal analysis.

The majority of the analyses that appear in publications of the Ohio State Geological Survey, volume 3, 1878, and volume 5, 1884, are purposely omitted, as those samples were not collected in an approved manner, and were taken mainly from outcrops and local mines, many of which are now exhausted. For those mines still in operation later analyses that are more reliable have been used. A few analyses from these early reports have been tabulated, as they are analyses of coals in localities where no later samples have been taken and show the presence of good minable coal which is not extensively worked at present.

Column 18 gives references to various bulletins that contain more detailed descriptions of the coal beds and sections from which the samples were collected. Those preceded by an "O" represent Ohio bulletins, others refer to Bureau of Mines bulletins. Nearly all the analyses taken from Bulletin 22, Bureau of Mines, were made by the United States Geological Survey at the coal-testing plant laboratory in St. Louis, Mo., were published in various United States Geological Survey reports and later incorporated in Bulletin 22. Other Bureau of Mines analyses were made in the coal laboratories at Pittsburgh, Pa., and Washington, D. C.

PEAT DEPOSITS.

The northern counties of Ohio, along Lake Erie, contain large deposits of peat. A number of samples have been collected in these localities by the Ohio Geological Survey and have been analyzed by the Bureau of Mines. Table 3 which contains these analyses is taken from Ohio Geological Survey Bulletin 16 on "Peat deposits of Ohio." In analyzing the samples, approved methods for coal analysis were used. As peat contains a large percentage of moisture, all the analyses were of air-dried samples, and the volatile combustible matter was determined by the modified method. In the tables, the moisture in the air-dried sample is stated, and the remainder of the analysis is given on the moisture-free basis.

---

[6] Stanton, F. M., and Fieldner, A. C., Methods of analyzing coal and coke: Tech. Paper 8, 1913, 42 pp.; Fieldner, A. C., Notes on the sampling and analysis of coal: Tech. Paper 76, Bureau of Mines. 1914. 59 pp.

FUSIBILITY OF COAL ASH.

In general the softening temperature of coal ash from the coals of the United States [7] ranges from 1,900° to 3,100° F. For convenience, the order of fusibility may be expressed by subdividing this range of softening temperature into three groups as follows:

Class I. Refractory ash, softening above 2,600° F.

Class II. Ash of medium fusibility, softening between 2,200° and 2,600° F.

Class III. Easily fusible ash, softening below 2,200° F.

The softening temperature is defined as the temperature at which a cone of the ash when heated in the test furnace with a slightly reducing atmosphere has fused down to a spherical lump.

The Bureau of Mines has determined the softening temperature of the ash of a large number of coals in the United States. The coals of Ohio that were tested gave ash of medium fusibility, mainly in Class II; a few have ash that is in the lower part of the refractory class, and some have ash that is in the upper part of Class I.

The actual temperatures observed in fusing-point determinations of the coals tested appear in column 17 of the table.

---

[7] Selvig, W. A. and Fieldner, A. C., Fusibility of ash from coals of the United States, Bull. 209, Bureau of Mines, 1922, 119 pp.

TABLE 2.—*Chemical analyses of mine samples.*

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (°F.).[c]	Reference.[d]
	Laboratory No.	Kind.[a]	Condition.[b]	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ATHENS COUNTY.																	
Broadwell, Berene Twp.; Federal mine, Pittsburgh bed.	24	D	1	6.6	35.1	48.1	10.2	3.4	5.1	66.6	0.9	13.8	......	6,606	11,890	......	O. 9.
			2	......	37.5	51.6	10.9	3.7	4.7	71.3	1.0	8.4	......	7,072	12,730	......	
			3	......	42.1	57.9	......	4.1	5.3	80.1	1.1	9.4	......	7,939	14,290	......	
Buchtel; Furnace mine, Upper Freeport bed	......	D	1	5.7	35.8	54.1	4.4	.6	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	38.0	57.3	4.7	.6	......	......	......	......	......	......	......	......	
Canaanville, Canaan Twp.; Canaan mine, Middle Kittanning bed (near air shaft).	89a	D	1	6.4	34.2	50.9	8.5	.5	5.4	69.3	1.4	14.9	......	6,917	12,450	......	O. 9.
			2	......	36.5	54.4	9.1	.5	5.0	74.0	1.5	9.9	......	7,389	13,300	......	
			3	......	40.2	59.8	......	.6	5.5	81.3	1.7	10.9	......	8,128	14,630	......	
Carbondale, sec. 36, Waterloo Twp.; Carbondale mine, Middle Kittanning bed (face sample).	84	D	1	6.7	35.4	51.1	6.8	2.3	5.5	69.2	1.2	15.0	......	6,922	12,460	......	O. 9.
			2	......	37.9	54.9	7.2	2.4	5.1	74.2	1.3	9.8	......	7,417	13,350	......	
			3	......	40.9	59.1	......	2.6	5.5	80.5	1.4	10.5	......	7,994	14,390	......	
Secs. 27 and 28, Waterloo Twp.; J. P. Hardy mine, Middle Kittanning bed.	85	D	1	6.8	36.9	48.2	8.1	2.1	5.5	67.4	1.4	15.5	......	6,794	12,230	......	O. 9.
			2	......	39.6	51.8	8.6	2.3	5.1	72.3	1.5	10.2	......	7,289	13,120	......	
			3	......	43.3	56.7	......	2.5	5.6	79.2	1.6	11.1	......	7,978	14,360	......	
Lathrop; Black Diamond mine, Pittsburgh bed (face sample).	23	D	1	5.8	37.4	48.8	8.0	4.2	5.1	67.6	1.0	14.2	......	6,833	12,300	......	O. 9.
			2	......	39.7	51.8	8.5	4.5	4.8	71.7	1.0	9.5	......	7,256	13,060	......	
			3	......	43.4	56.6	......	4.9	5.2	78.3	1.1	10.5	......	7,928	14,270	......	
Luhrig, sec. 4, Athens Twp.; Luhrig mine, Middle Kittanning bed (face sample).	83	D	1	6.2	36.4	49.6	7.8	.9	5.4	69.2	1.3	15.4	......	6,868	12,360	......	O. 9.
			2	......	38.8	52.9	8.3	1.0	5.1	73.8	1.4	10.4	......	7,322	13,180	......	
			3	......	42.3	57.7	......	1.1	5.5	80.5	1.5	11.4	......	7,983	14,370	......	
Nelsonville, sec. 35, Dover Twp.; Happy Hollow mine, Upper Freeport bed.	136	D	1	5.1	37.0	49.7	8.3	2.4	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	39.0	52.3	8.7	2.5	......	......	......	......	......	......	......	......	
Sec. 24, across the Hocking River from Nelsonville; Johnson & Patterson mine, Middle Kittanning bed.	127	D	1	5.4	37.5	51.6	5.5	1.2	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	39.7	54.5	5.8	1.3	......	......	......	......	......	......	......	......	
Sec. 27, Dover Twp.; Continental Coal Co., Middle Kittanning bed (face sample).	89	D	1	7.1	34.2	52.0	6.7	1.7	5.6	69.3	1.3	15.4	......	6,861	12,350	......	O. 9.
			2	......	36.9	55.9	7.2	1.8	5.1	74.7	1.4	9.8	......	7,389	13,300	......	
			3	......	39.7	60.3	......	1.9	5.5	80.5	1.5	10.6	......	7,967	14,340	......	
Trimble Twp., sec. 8; Continental No. 4 mine, Middle Kittanning bed (face sample).	90	D	1	7.3	32.4	53.6	6.7	.9	5.5	69.5	1.3	16.1	......	6,894	12,410	......	O. 9.
			2	......	34.9	57.8	7.3	.9	5.0	74.9	1.5	10.4	......	7,433	13,380	......	
			3	......	37.7	62.3	......	1.0	5.4	80.8	1.6	11.2	......	8,017	14,430	......	
Along Mud Fork; Johnson coal bank, Upper Freeport bed.	135	D	1	4.4	41.4	50.1	4.1	3.4	......	......	......	......	......	......	......	......	O. Vol. V
			2	......	43.4	52.3	4.3	3.5	......	......	......	......	......	......	......	......	

BELMONT COUNTY.																	
Alledonia, 1½ miles southwest of, sec. 33, T. 5. N., R. 4 W.; S. A. Moore mine, Washington bed (50 feet east of mine mouth).	20238	B	1	4.1	33.7	41.2	21.0	2.9	4.8	59.9	1.1	10.3	2.3	6,011	10,820	2,520	123.
			2	......	35.1	43.0	21.9	3.0	4.5	62.5	1.1	7.0	......	6,267	11,280	....	
			3	......	45.0	55.0	......	3.8	5.8	80.0	1.5	8.9	......	8,028	14,450	....	
1 mile north of, sec. 22, T. 5 N., R. 4 W.; Shipman Bros. mine, Meigs Creek bed (40 feet west of mine mouth).	20237	B	1	3.5	37.2	41.5	17.8	4.1	......	......	......	......	1.6	6,394	11,510	2,060	123.
			2	......	38.5	43.0	18.5	4.2	......	......	......	......	......	6,628	11,930	....	
1 mile southwest of, sec. 27, T. 5 N., R. 4 W.; Stoffel mine, Waynesburg bed (50 feet southwest of mine mouth).	20236	B	1	4.6	36.8	44.1	14.5	2.6	......	......	......	......	2.4	6,572	11,830	2,390	123.
			2	......	38.6	46.3	15.1	2.7	......	......	......	......	......	6,889	12,400	....	
Armstrong Mills, NE. ¼ sec. 10, Washington Twp.; Captina mine, Pittsburgh bed (face sample).	9	D	1	2.8	37.9	49.9	9.4	5.1	5.3	69.8	1.1	9.3	......	7,217	12,990	....	O. 9.
			2	......	39.0	51.3	9.7	5.2	5.1	71.8	1.1	7.1	......	7,422	13,360	....	
			3	......	43.2	56.8	......	5.8	5.6	79.5	1.2	7.9	......	8,217	14,790	....	
Baileys Mills, 3½ miles southwest of Barnesville, sec. 31, T. 8 N., R. 6 W.; Cochran No. 2 mine, Pittsburgh bed (face of main north entry).	20187	B	1	4.1	42.7	43.9	9.3	4.5	......	......	......	......	2.3	7,072	12,730	1,960	123.
Same (face of 6 room, 15 west entry, ¾ mile north of mine mouth).	20188	B	1	3.7	43.3	44.4	8.6	4.5	......	......	......	......	1.7	7,194	12,950	1,960	123.
Same (composite of samples 20187 and 20188).....	20189	B	1	3.9	43.1	43.9	9.1	4.4	5.5	70.0	1.3	9.7	2.0	7,133	12,840	....	123.
			2	......	44.8	45.8	9.4	4.5	5.2	72.8	1.3	6.8	......	7,422	13,360	....	
			3	......	49.5	50.5	......	5.0	5.8	80.4	1.5	7.3	......	8,222	14,800	....	
Sec. 21, Warren Twp.; Media mine, Pittsburgh bed.	10	D	1	4.5	37.5	47.0	11.0	4.7	5.2	67.6	1.1	10.4	......	6,878	12,380	....	O. 9.
			2	......	39.3	49.2	11.5	4.9	4.9	70.8	1.1	6.8	......	7,194	12,950	....	
			3	......	44.4	55.6	......	5.5	5.5	80.0	1.3	7.7	......	8,133	14,640	....	
Barnesville, Warren Twp.; William Davis & Bro. mine, Meigs Creek bed.	233	D	1	2.1	40.1	47.7	10.1	3.0	......	......	......	......	......	......	......	....	O. Vol. V.
			2	......	40.9	48.8	10.3	3.0	......	......	......	......	......	......	......	....	
1 mile southwest of sec. 20, T. 8 N., R. 6 W.; Thomas Davy mine, Meigs Creek bed (350 feet southwest of mine mouth).	20176	B	1	4.3	39.0	45.5	11.2	3.7	5.3	68.2	1.2	10.4	2.4	6,889	12,400	2,490	123.
			2	......	40.7	47.6	11.7	3.8	5.1	71.3	1.3	6.8	......	7,206	12,970	....	
			3	......	46.1	53.9	......	4.3	5.7	80.7	1.4	7.9	......	8,161	14,690	....	
Maulden mine, Meigs Creek bed................	37	D	1	4.5	35.3	47.1	13.1	3.3	5.0	65.5	1.1	11.8	......	6,667	12,000	....	
			2	......	37.0	49.3	13.7	3.4	4.7	68.9	1.2	8.1	......	6,978	12,560	....	O. 9.
			3	......	42.8	57.2	......	4.0	5.4	79.8	1.4	9.4	......	8,089	14,560	....	
Bellaire; Empire No. 1 mine, Pittsburgh bed (face of 3 room, 4 west entry).	3987	A	1	3.3	40.8	49.1	6.8	3.6	......	......	......	......	1.2	......	......	....	22.
			2	......	42.2	50.8	7.0	3.7	......	......	......	......	......	......	......	....	
Same (face of 24 room, 10 entry)................	3988	A	1	3.1	40.8	50.1	6.0	3.4	......	......	......	......	1.1	7,556	13,600	....	22.
			2	......	42.1	51.7	6.2	3.5	......	......	......	......	......	7,794	14,030	....	
1 mile south of, Pultney Twp.; Empire mine....	3	D	1	3.5	38.6	51.0	6.9	3.8	5.5	72.1	1.2	10.5	......	7,328	13,190	....	O. 9.
			2	......	40.1	52.8	7.1	3.9	5.2	74.7	1.2	7.9	......	7,594	13,670	....	
			3	......	43.1	56.9	......	4.2	5.6	80.4	1.3	8.5	......	8,172	14,710	....	
Bethesda, 1 mile northwest of; Badgertown mine, Meigs Creek bed.	4053	B	1	4.2	36.4	47.9	11.5	3.2	......	......	......	......	1.8	......	......	....	22.
			2	......	38.0	50.0	12.0	3.3	......	......	......	......	......	......	......	....	

[a] The kind of sample is denoted by letter as follows: A, mine sample collected by inspector of the Bureau of Mines; B, mine sample collected by a geologist of the United States Geological Survey; D, mine sample collected by a geologist of the Ohio Geological Survey.

[b] The form of analysis is denoted by number as follows: 1, sample as received; 2, dried at a temperature of 105° C.; 3, moisture and ash free condition.

[c] Softening temperature denotes the temperatures, ° F., at which the cone of coal ash will fuse to a spherical lump when heated in the furnace.

[d] The numbers in column 18 refer to the Bureau of Mines bulletins in which may be found the description of the mine and sections from which the samples were taken. Those numbers designated with an "O" refer to Ohio Geological Survey bulletins where the same information may be found.

Table 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
BELMONT COUNTY—continued.																	
Bridgeport, Pease Twp.; Ætna Standard Mill mine, Pittsburgh bed.	1	D	1	3.4	36.8	51.9	7.9	3.0	5.2	71.5	1.2	11.2	......	7,216	12,990	......	O. 9.
			2	......	38.1	53.8	8.1	3.1	5.0	74.0	1.3	8.5	......	7,472	13,450	......	
			3	......	41.5	58.5	......	3.3	5.4	80.5	1.4	9.4	......	8,133	14,640	......	
Fairport, Wheeling Twp.; Columbiana Coal Co. mine, Pittsburgh bed.	6a	D	1	4.3	33.5	51.8	10.4	4.0	5.2	68.2	1.1	11.1	......	6,906	12,430	......	O. 9.
			2	......	35.0	54.2	10.8	4.1	4.9	71.2	1.1	7.9	......	7,211	12,980	......	
			3	......	39.3	60.7	......	4.6	5.5	79.8	1.3	8.8	......	8,083	14,550	......	
Flushing, 1 mile southeast of; White mine, Meigs Creek bed.	4054	B	1	4.6	33.8	52.6	9.0	2.2	......	......	......	......	1.7	......	......	......	22.
			2	......	35.5	55.0	9.5	2.3	......	......	......	......	......	......	......	......	
Flushing Coal Co. mine, Meigs Creek bed	36	D	1	5.0	33.3	48.9	12.8	2.4	5.0	66.3	1.2	12.3	......	6,650	11,970	......	O. 9.
			2	......	35.1	51.4	13.5	2.5	4.6	69.8	1.3	8.3	......	7,000	12,600	......	
			3	......	40.5	59.5	......	2.9	5.4	80.7	1.4	9.6	......	8,094	14,570	......	
Kennon mine, Pittsburgh bed	2a	D	1	4.2	36.3	50.3	9.2	4.2	5.1	68.8	1.1	11.6	......	7,000	12,600	......	O. 9.
			2	......	38.0	52.4	9.6	4.4	4.9	71.8	1.1	8.2	......	7,311	13,160	......	
			3	......	42.0	58.0	......	4.8	5.4	79.4	1.3	9.1	......	8,089	14,560	......	
2 miles southeast of; Black Oak mine, Pittsburgh bed (2,000 feet west of shaft).	3985	A	1	4.0	38.1	48.9	9.0	4.3	......	......	......	......	1.7	......	......	......	
			2	......	39.7	50.9	9.4	4.4	......	......	......	......	......	......	......	......	22.
Same (1,500 feet southwest of shaft)	3986	A	1	4.1	39.2	48.7	8.0	4.2	......	......	......	......	1.9	7,272	13,090	......	22.
			2	......	40.9	50.8	8.3	4.3	......	......	......	......	......	7,583	13,650	......	22.
Glencoe, ½ mile west of, Smith Twp.; Delora No. 1 mine, Pittsburgh bed.	7	D	1	3.2	36.8	52.7	7.3	4.3	5.1	71.5	1.1	10.7	......	7,294	13,130	......	O. 9.
			2	......	38.0	54.5	7.5	4.4	4.9	73.9	1.1	8.2	......	7,539	13,570	......	
			3	......	41.1	58.9	......	4.8	5.3	79.9	1.2	8.8	......	8,150	14,670	......	
Goshen Twp., S. E. ¼ sec. 31; Statler mine, Meigs Creek bed.	40	D	1	3.4	35.7	46.0	14.9	4.4	4.9	64.8	1.1	9.9	......	6,578	11,840	......	O. 9.
			2	......	37.0	47.5	15.5	4.5	4.6	67.1	1.1	7.2	......	6,811	12,260	......	
			3	......	43.8	56.2	......	5.4	5.5	79.3	1.3	8.5	......	8,056	14,500	......	
Hunter, 1½ miles northeast of; Milhoan mine, Waynesburg bed (50 feet south of mine mouth).	20174	B	1	4.3	35.3	44.1	16.2	3.5	5.0	64.1	1.2	10.0	2.2	6,450	11,610	2,380	123.
			2	......	36.9	46.1	17.0	3.7	4.7	67.0	1.3	6.3	......	6,739	12,130	......	
			3	......	44.4	55.6	......	4.4	5.7	80.7	1.5	7.7	......	8,111	14,600	......	
2 miles east of sec. 1, T. 7 N., R. 5 W.; Peter Kemp prospect, Uniontown bed (20 feet west of mine mouth).	20775	B	1	4.7	34.2	45.8	15.3	2.9	5.0	63.7	1.3	11.8	2.6	6,478	11,660	2,160	123.
			2	......	35.9	48.0	16.1	3.0	4.7	66.9	1.4	7.9	......	6,800	12,240	......	
			3	......	42.8	57.2	......	3.6	5.5	79.7	1.7	9.5	......	8,106	14,590	......	
Lafferty, Union Twp.; Wheeling Valley Coal Co. mine, Pittsburgh bed.	5	D	1	4.5	36.0	48.7	10.8	4.5	4.9	68.2	1.1	10.5	......	6,906	12,430	......	O. 9.
			2	......	37.7	51.0	11.3	4.7	4.6	71.4	1.2	6.8	......	7,228	13,010	......	
			3	......	42.5	57.5	......	5.3	5.1	80.5	1.3	7.8	......	8,144	14,660	......	

Martins Ferry; Laughlin mine, Pittsburgh bed (right rib, 50 feet from face of main entry).	34002	A	1	4.0	39.6	48.3	8.1	3.4	......	......	......	......	2.7	7,222	13,000	2,040	
Same (last crosscut, 17 and 18 right butts, 23 south entry).	34003	A	1	3.9	38.9	48.0	9.2	3.6	......	......	......	......	2.4	7,144	12,860	2,040	
Same (left rib, 50 feet from face of 23 south entry)	34004	A	1	3.9	38.7	49.3	8.1	3.3	......	......	......	......	2.6	7,244	13,040	2,040	
Same (composite of samples 34002, 34003, and 34004)	34005	A	1	3.9	39.6	48.0	8.5	3.4	5.3	71.2	1.3	10.3	2.6	7,200	12,960	......	
			2	......	41.2	49.9	8.9	3.6	5.0	74.1	1.4	7.0	......	7,494	13,490	......	
			3	......	45.2	54.8	......	3.9	5.5	81.3	1.5	7.8	......	8,222	14,800	......	
Neffs; Neff No. 1 mine, Pittsburgh bed (face of 12 room, 4 east entry, 2,000 feet southeast of mine mouth).	2095	A	1	4.0	38.8	49.1	8.1	3.5	......	......	......	......	1.8	7,278	13,100	......	22.
			2	......	40.4	51.2	8.4	3.6	......	......	......	......	......	7,583	13,650	......	22.
Same (face of 3 room, 2 west entry, 1,000 feet southwest of mine mouth).	2096	A	1	4.1	39.5	50.1	6.4	3.4	......	......	......	......	1.8	......	......	......	
			2	......	41.1	52.2	6.7	3.5	......	......	......	......	......	......	......	......	
Pultney Twp., sec. 13; Neff No. 2 mine, Pittsburgh bed.	4	D	1	3.8	37.2	50.0	9.0	4.3	5.2	70.6	1.2	9.7	......	7,106	12,790	......	O. 9.
			2	......	38.7	52.0	9.3	4.4	5.0	73.4	1.3	6.5	......	7,383	13,290	......	
			3	......	42.6	57.4	......	4.9	5.5	80.9	1.4	7·3	......	8,139	14,650	......	
Mead Twp., 1 mile above mouth of Pipe Creek on Ohio River; Johnson Bros. mine, Pittsburgh bed.	8	D	1	2.9	37.9	51.2	8.0	4.3	5.1	73.0	1.0	8.6	......	7,339	13,210	......	O. 9.
			2	......	39.1	52.7	8.2	4.4	4.9	75.1	1.1	6.3	......	7,561	13,610	......	
			3	......	42.6	57.4	......	4.8	5.4	81.9	1.2	6.7	......	8,239	14,830	......	
Somerton, 2 miles southeast of, sec. 26, T. 6 N., R. 5 W.; Howard Brown mine, Waynesburg bed (100 feet west of mine mouth).	20234	B	1	4.4	37.1	43.1	15.4	2.9	......	......	......	......	2.3	6,478	11,660	2,460	123.
			2	......	38.8	45.0	16.2	3.0	......	......	......	......	......	6,772	12,190	......	
Temperanceville, sec. 33, T. 7 N., R. 6 W.; Jeffries mine, Pittsburgh bed (600 feet north of mine mouth).	20230	B	1	3.7	41.0	45.8	9.5	4.6	......	......	......	......	2.0	7,089	12,760	2,260	123.
			2	......	42.6	47.5	9.9	4.8	......	......	......	......	......	7,361	13,250	......	
Union Twp., S. E. ¼ sec. 25; J. S. Calbert mine, Meigs Creek bed.	39	D	1	4.2	35.1	51.1	9.6	3.1	5.0	69.9	1.1	11.3	......	7,000	12,600	......	O. 9.
			2	......	36.6	53.4	10.0	3.3	4.7	72.9	1.1	8.0	......	7,306	13,150	......	
			3	......	40.7	59.3	......	3.6	5.2	81.1	1.3	8.8	......	8,117	14,610	......	
CARROLL COUNTY.																	
Dell Roy; Empire No. 2 mine, Upper Freeport bed	105	D	1	3.8	36.3	55.0	4.9	1.6	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	37.7	57.2	5.1	1.6	......	......	......	......	......	......	......	......	
Empire No. 3 mine, Upper Freeport bed	60	D	1	4.2	37.0	51.6	7.2	3.1	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	38.6	53.9	7.5	3.2	......	......	......	......	......	......	......	......	
Minerva, 6 miles from, Augusta Twp.; W. Scott mine, Middle Kittanning bed (average of analyses of top, middle, and bottom benches).	....	D	1	3.2	32.5	59.6	4.7	1.5	......	......	......	......	......	......	......	......	O. Vol. III.
			2	......	33.6	61.5	4.9	1.5	......	......	......	......	......	......	......	......	
Sherrodsville, Orange Twp.; Somers Coal Co. mine, Middle Kittanning bed.	132	D	1	3.8	39.1	50.3	6.8	3.1	5.4	72.0	1.4	11.3	......	7,239	13,030	......	O. 9.
			2	......	40.6	52.3	7.1	3.2	5.1	74.8	1.5	8.3	......	7,522	13,540	......	
			3	......	43.7	56.3	......	3.4	5.5	80.5	1.6	9.0	......	8,094	14,570	......	
COLUMBIANA COUNTY.																	
East Liverpool, mouth of Dry Run; W. J. Blackford mine Middle Kittanning bed.	137	D	1	3.6	36.2	55.6	4.6	1.8	5.5	77.1	1.4	9.6	......	7,789	14,020	......	O. 9.
			2	......	37.5	57.7	4.8	1.8	5.2	79.9	1.4	6.9	......	8,078	14,540	......	
			3	......	39.4	60.6	......	1.9	5.5	83.9	1.5	7.2	......	8,483	15,270	......	
3 miles northeast of; Delaney coal bank, Middle Kittanning bed (65 feet north of mine mouth).	25592	B	1	4.3	36.8	54.3	4.6	1.5	......	......	......	......	1.7	7,589	13,660	2,430	193.
			2	......	38.4	56.8	4.8	1.5	......	......	......	......	......	7,933	14,280	......	
3½ miles northeast of; Duck coal bank, Middle Kittanning bed (50 feet northeast of mine mouth).	25589	B	1	5.1	35.8	53.1	6.0	2.1	......	......	......	......	2.7	7,411	13,340	2,220	193.
			2	......	37.7	56.0	6.3	2.2	......	......	......	......	......	7,811	14,060	......	
2¾ miles northeast of; Gaston coal bank, Upper Freeport bed (65 feet northeast of mine mouth).	25583	B	1	5.3	36.3	49.5	8.9	4.0	......	......	......	......	3.0	7,117	12,810	2,050	193.
			2	......	38.3	52.3	9.4	4.2	......	......	......	......	......	7,517	13,530	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
COLUMBIANA COUNTY—continued.																	
East Liverpool, mouth of Dry Run; W. J. Blackford mine Middle Kittanning bed—Continued.																	
1½ miles northeast, of sec. 33; Johnson coal bank, Middle Kittanning bed (50 feet north of mine mouth).	25588	B	1	4.8	34.8	53.0	7.4	1.8	5.4	74.0	1.4	10.0	2.7	7,328	13,190	2,600	193.
			2	......	36.6	55.6	7.8	1.9	5.1	77.7	1.5	6.0	......	7,700	13,860	......	
			3	......	39.7	60.3	......	2.0	5.5	84.3	1.6	6.6	......	8,350	15,030	......	
2½ miles northeast of, S. W. ¼ sec. 28; Kinsey coal bank, Lower Freeport bed (65 feet from mine mouth).	25585	B	1	3.6	38.5	47.4	10.5	4.5	5.4	70.0	1.6	8.0	1.8	7,139	12,850	2,300	193.
			2	......	39.9	49.2	10.9	4.7	5.2	72.6	1.6	5.0	......	7,406	13,330	......	
			3	......	44.8	55.2	......	5.2	5.8	81.5	1.8	5.7	......	8,306	14,950	......	
½ mile north of, sec. 24; Malone's coal bank, Lower Kittanning bed (15 feet northeast of mine mouth).	25590	B	1	2.7	41.7	44.0	11.6	8.0	......	......	......	......	1.2	7,083	12,750	2,400	193.
			2	......	42.9	45.2	11.9	8.3	......	......	......	......	......	7,278	13,100	......	
3½ miles northeast of, S. E. ¼ sec. 23; Moore's coal bank, Lower Freeport bed (60 feet southwest of mine mouth).	25586	B	1	4.3	36.4	47.7	11.6	3.0	......	......	......	......	2.2	6,978	12,560	2,470	193.
			2	......	38.1	49.7	12.2	3.2	......	......	......	......	......	7,289	13,120	......	
4 miles northeast of, W. ½ sec. 24; Smith mine, Middle Kittanning bed (125 feet east of mine mouth).	25584	B	1	4.0	36.7	53.0	6.3	2.6	5.5	74.7	1.6	9.3	1.7	7,494	13,490	2,420	193
			2	......	38.2	55.3	6.5	2.7	5.2	77.8	1.7	6.1	......	7,811	14,060	......	
			3	......	40.9	59.1	......	2.9	5.6	83.2	1.8	6.5	......	8,356	15,040	......	
East Palestine; State Line mine, Upper Freeport bed.	208	D	1	2.1	39.4	53.4	5.1	2.9	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	40.4	54.4	5.2	2.9	......	......	......	......	......	......	......	......	
Leetonia; Leetonia mine of the Cherry Valley Iron Works, Lower Kittanning bed.	218	D	1	3.6	37.9	56.1	2.4	.8	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	39.3	58.2	2.5	.9	......	......	......	......	......	......	......	......	
New Salisbury, ½ mile northeast of; McClain mine, Upper Freeport bed (900 feet east of mine mouth).	25892	B	1	3.5	36.7	48.9	10.9	4.3	5.2	69.9	1.4	8.3	1.5	7,072	12,730	2,030	193.
			2	......	38.1	50.6	11.3	4.4	5.0	72.4	1.4	5.5	......	7,328	13,190	......	
			3	......	42.9	57.1	......	5.0	5.7	81.6	1.6	6.1	......	8,261	14,870	......	
Wellsville; Ainsworth mine, Lower Kittanning bed (30 feet southeast of mine mouth).	25898	B	1	4.5	40.9	49.6	5.0	3.5	......	......	......	......	2.6	7,539	13,570	2,060	193.
			2	......	42.8	52.0	5.2	3.7	......	......	......	......	......	7,894	14,210	......	
Dangelo mine, Mahoning bed (40 feet south of mine mouth).	25896	B	1	3.2	39.3	51.1	6.4	3.6	5.6	75.4	1.4	7.6	1.1	7,550	13,590	2,040	193.
			2	......	40.6	52.8	6.6	3.7	5.4	77.8	1.4	5.1	......	7,794	14,030	......	
			3	......	43.5	56.5	......	3.9	5.8	83.3	1.5	5.5	......	8,344	15,020	......	
1½ miles northwest of; Householders' mine, Upper Freeport bed (20 feet southwest of mine mouth).	25894	B	1	5.1	38.0	48.6	8.3	3.8	......	......	......	......	2.9	7,200	12,960	2,440	193.
			2	......	40.1	51.2	8.7	4.0	......	......	......	......	......	7,589	13,660	......	
Schekler's mine, Lower Freeport bed (55 feet northwest of mine mouth).	25895	B	1	5.9	32.7	49.9	11.5	1.5	5.3	68.3	1.4	12.0	3.6	6,728	12,110	2,520	193.
			2	......	34.8	52.9	12.3	1.6	4.9	72.6	1.4	7.2	......	7,150	12,870	......	
			3	......	39.7	60.3	......	1.8	5.6	82.8	1.6	8.2	......	8,150	14,670	......	

3 miles northwest of; Smith's mine, Upper Freeport bed (150 feet southwest of mine mouth).	25893	B	1	3.4	37.8	51.3	7.5	2.9	5.5	74.3	1.5	8.3	1.4	7,428	13,370	2,400	193.
			2	......	39.2	53.0	7.8	3.0	5.3	77.0	1.5	5.4	......	7,689	13,840	......	
			3	......	42.4	57.6	......	3.2	5.8	83.4	1.7	5.9	......	8,333	15,000	......	
Wooster's clay mine, Lower Kittanning bed (100 feet southwest of mine mouth).	25897	B	1	2.7	38.5	50.1	8.7	5.7	......	......	......	......	1.1	7,339	13,210	2,060	193.
			2	......	39.5	51.6	8.9	5.9	......	......	......	......	......	7,539	13,570	......	
Wooster's strip pit, Middle Kittanning bed (340 feet west of mine mouth).	25900	B	1	3.4	34.7	51.1	10.8	.7	5.2	71.6	1.5	10.2	1.2	7,128	12,830	2,600	193.
			2	......	35.9	53.0	11.1	.7	5.0	74.2	1.5	7.5	......	7,378	13,280	......	
			3	......	40.4	59.6	......	.8	5.6	83.4	1.7	8.5	......	8,306	14,950	......	
West Point; West Point mine, Upper Freeport bed (1,800 feet southwest of mine mouth).	25580	B	1	3.4	37.9	51.6	7.1	2.9	......	......	......	......	1.5	7,472	13,450	......	193.
Same (500 feet northeast of mine mouth)........	25581	B	1	3.8	38.3	49.9	8.0	3.7	......	......	......	......	1.8	7,400	13,320	2,240	193.
Same (composite of samples 25580 and 25581).....	25582	B	1	3.6	37.8	51.2	7.4	3.2	5.4	73.7	1.9	8.4	1.6	7,439	13,390	......	193.
			2	......	39.2	53.1	7.7	3.3	5.1	76.4	1.9	5.6	......	7,717	13,890	......	
			3	......	42.5	57.5	......	3.6	5.6	82.8	2.1	5.9	......	8,356	15,040	......	
COSHOCTON COUNTY.																	
Adams Twp., sec. 1; Young Bros. mine, Middle Kittanning bed.	114	D	1	4.6	39.2	47.4	8.8	5.4	5.4	67.5	1.2	11.7	......	6,878	12,380	......	O. 9.
			2	......	41.1	49.7	9.2	5.6	5.1	70.8	1.3	8.0	......	7,211	12,980	......	
			3	......	45.2	54.8	......	6.2	5.6	77.9	1.4	8.9	......	7,939	14,290	......	
Conesville, Virginia Twp.; Charles Fillomlee mine, Middle Kittanning bed.	109	D	1	5.1	39.0	48.9	7.0	3.9	5.5	69.5	1.2	12.9	......	7,067	12,720	......	O. 9.
			2	......	41.1	51.5	7.4	4.1	5.1	73.2	1.3	8.9	......	7,450	13,410	......	
			3	......	44.4	55.6	......	4.4	5.6	79.1	1.4	9.5	......	8,044	14,480	......	
Clark Twp., sec. 22; William Darr mine, Upper Freeport bed (upper bench).	151	D	1	6.4	37.9	52.5	3.2	2.0	5.7	72.7	1.3	15.1	......	7,328	13,190	......	O. 9.
			2	......	40.5	56.1	3.4	2.2	5.3	77.7	1.3	10.1	......	7,828	14,090	......	
			3	......	41.9	58.1	......	2.2	5.5	80.4	1.4	10.5	......	8,100	14,580	......	O. 9.
Sec. 20; G. W. Levengood mine, Middle Kittanning bed.	106	D	1	5.3	39.1	49.4	6.2	3.7	5.5	69.6	1.1	13.9	......	7,083	12,750	......	
			2	......	41.3	52.2	6.5	3.9	5.2	73.5	1.2	9.7	......	7,483	13,470	......	
			3	......	44.1	55.9	......	4.2	5.5	78.6	1.3	10.4	......	8,000	14,400	......	
Coshocton, Tuscarawas Twp.; Home mine, Middle Kittanning bed.	26	D	1	5.1	42.1	48.3	4.5	2.9	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	44.3	51.0	4.7	3.1	......	......	......	......	......	......	......	......	
Crawford Twp., sec. 4; John S. Baker mine, Middle Kittanning bed.	117	D	1	4.7	39.2	44.8	11.3	5.6	5.2	64.8	1.1	12.0	......	6,594	11,870	......	O. 9.
			2	......	41.1	47.0	11.9	5.9	4.9	68.0	1.2	8.1	......	6,922	12,460	......	
			3	......	46.7	53.3	......	6.7	5.6	77.1	1.3	9.3	......	7,850	14,130	......	
Franklin Twp.; Best Coal Co. mine, Middle Kittanning bed.	108	D	1	4.3	41.1	49.0	5.6	4.0	5.4	71.4	1.2	12.4	......	7,267	13,080	......	O. 9.
			2	......	43.0	51.2	5.8	4.2	5.2	74.7	1.3	8.8	......	7,600	13,680	......	
			3	......	45.6	54.4	......	4.4	5.5	79.3	1.4	9.4	......	8,067	14,520	......	
Jackson Twp., sec. 17; A. W. Marshall mine, Middle Kittanning bed.	105	D	1	5.3	40.9	47.5	6.3	4.2	5.5	69.3	1.2	13.5	......	7,083	12,750	......	O. 9.
			2	......	43.2	50.1	6.7	4.5	5.2	73.2	1.3	9.1	......	7,483	13,470	......	
			3	......	46.3	53.7	......	4.8	5.6	78.4	1.4	9.8	......	8,017	14,430	......	
Lafayette Twp.; J. W. Patton mine, Middle Kittanning bed.	110	D	1	5.6	34.7	46.4	13.3	4.9	5.0	61.6	1.1	14.1	......	6,222	11,200	......	O. 9.
			2	......	36.8	49.1	14.1	5.2	4.6	65.2	1.1	9.8	......	6,589	11,860	......	
			3	......	42.8	57.2	......	6.0	5.3	75.9	1.3	11.5	......	7,672	13,810	......	
Linton Twp., sec. 24; W. J. Young mine, Middle Kittanning bed.	111	D	1	4.4	41.0	49.2	5.4	3.6	5.6	71.3	1.3	12.8	......	7,244	13,040	......	O. 9.
			2	......	42.8	51.6	5.6	3.8	5.3	74.6	1.3	9.4	......	7,578	13,640	......	
			3	......	45.4	54.6	......	4.0	5.6	79.0	1.4	10.0	......	8,028	14,450	......	
Keene Twp.; E. McClure mine, Middle Kittanning bed.	107	D	1	5.4	39.9	49.6	5.1	3.2	5.6	70.9	1.2	14.0	......	7,194	12,950	......	O. 9.
			2	......	42.2	52.4	5.4	3.4	5.3	75.0	1.3	9.6	......	7,606	13,690	......	
			3	......	44.6	55.4	......	3.6	5.6	79.2	1.4	10.2	......	8,039	14,470	......	
Oxford Twp., sec. 20; Peter Henricks mine, Middle Kittanning bed.	113	D	1	4.4	40.7	50.4	4.5	3.5	5.5	72.7	1.4	12.4	......	7,350	13,230	......	O. 9.
			2	......	42.6	52.7	4.7	3.7	5.3	76.0	1.4	8.9	......	7,694	13,850	......	
			3	......	44.7	55.3	......	3.9	5.5	79.8	1.5	9.3	......	8,067	14,520	......	
Warsaw, N. ½ Bedford Twp.; Jos. Sharpless mine (Bedford cannel coal).	25	D	1	2.4	47.1	36.9	13.6	2.3	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	48.2	37.9	13.9	2.4	......	......	......	......	......	......	......	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (°F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
COSHOCTON COUNTY—continued.																	
White Eyes Twp., sec. 24; Lewis McFarland mine, Middle Kittanning bed.	120	D	1	4.5	38.7	50.8	6.0	3.6	5.5	70.9	1.3	12.7	......	7,172	13,910	......	O. 9.
			2	......	40.6	53.1	6.3	3.8	5.3	74.3	1.4	8.9	......	7,511	13,520	......	
			3	......	43.3	56.7	......	4.1	5.6	79.2	1.5	9.6	......	8,011	14,420	......	
Sec. 5; Adam Miller mine, Middle Kittanning bed.	118	D	1	5.3	37.4	48.7	8.6	4.4	5.3	67.4	1.2	13.1	......	6,828	12,290	......	O. 9.
			2	......	39.5	51.4	9.1	4.6	5.0	71.2	1.3	8.8	......	7,211	12,980	......	
			3	......	43.4	56.6	......	5.1	5.5	78.3	1.4	9.7	......	7,933	14,280	......	
GALLIA COUNTY.																	
Carlton, Cheshire Twp.; Minshall Coal Co. mine, Pomeroy bed.	34	D	1	8.2	34.2	46.1	11.5	2.2	5.5	63.0	1.0	16.8	......	6,389	11,500	......	O. 9.
			2	......	37.3	50.2	12.5	2.4	5.0	68.6	1.1	10.5	......	6,956	12,520	......	
			3	......	42.6	57.4	......	2.7	5.7	78.4	1.3	11.9	......	7,950	14,310	......	
Greenfield Twp., sec. 9; Black Diamond mine, Middle Kittanning bed (fresh face, upper bench).	82b	D	1	8.1	37.5	45.9	8.5	3.6	5.5	65.7	1.2	15.5	......	6,717	12,090	......	O. 9.
			2	......	40.8	49.9	9.3	4.0	5.0	71.5	1.3	8.9	......	7,306	13,150	......	
			3	......	45.0	55.0	......	4.4	5.5	78.8	1.4	9.9	......	8,056	14,500	......	
Green Twp., sec. 7; Odell coal bank, Pittsburgh bed.	26	D	1	6.7	34.3	46.0	13.0	4.4	5.1	62.3	1.1	14.1	......	6,356	11,440	......	O. 9.
			2	......	36.8	49.2	14.0	4.7	4.7	66.8	1.2	8.6	......	6,817	12,270	......	
			3	......	42.8	57.2	......	5.5	5.4	77.7	1.4	10.0	......	7,922	14,260	......	
Harrison Twp., sec. 6; Kerns' bank, Pittsburgh bed.	27	D	1	7.0	36.1	47.9	9.0	5.2	5.2	64.9	1.0	14.7	......	6,583	11,850	......	O. 9.
			2	......	38.9	51.4	9.7	5.6	4.8	69.8	1.1	9.0	......	7,078	12,740	......	
			3	......	43.0	57.0	......	6.2	5.3	77.3	1.2	10.0	......	7,839	14,110	......	
GUERNSEY COUNTY.																	
Byesville; Cambridge and Akron mine, Upper Freeport bed.	112	D	1	3.3	35.9	54.1	6.7	1.7	......	......	......	......	......	......	......	......	O. Vol. 5.
			2	......	37.1	55.9	7.0	1.7	......	......	......	......	......	......	......	......	
Cambridge Twp., Leatherwood Creek; Guernsey mine, Upper Freeport bed.	199	D	1	5.3	37.5	53.3	3.9	1.4	......	......	......	......	......	......	......	......	O. Vol. 5.
			2	......	39.6	56.2	4.2	1.5	......	......	......	......	......	......	......	......	
Cambridge, 2 miles south of, Wills Creek Valley; Nicholson mine, Upper Freeport bed.	111	D	1	3.8	37.9	53.9	4.4	1.4	......	......	......	......	......	......	......	......	O. Vol. 5.
			2	......	39.4	56.0	4.6	1.4	......	......	......	......	......	......	......	......	

Danford: Forsythe mine, No. 7 bed (face of 1 room, 16 east entry, 2,600 feet northwest of slope bottom).	2090	A	1	6.3	35.8	50.6	7.3	3.6	......	......	......	......	2.6	7,056	12,700	......	22.
			2	......	38.2	54.0	7.8	3.8	......	......	......	......	......	7,528	13,550	......	
Same (face of 22 room, 14 east entry, 3,700 feet northeast of slope bottom).	2091	A	1	5.8	36.9	50.7	6.6	2.6	......	......	......	......	2.2	......	......	......	22.
			2	......	39.2	53.8	7.0	2.8	......	......	......	......	......	......	......	......	
Hartford, 1 mile southeast of, sec. 11, T. 8 N., R. 9 W.; Andy Slovak mine, Bakerstown bed (75 feet east of mine mouth).	20243	B	1	4.3	40.2	45.1	10.4	3.8	5.4	68.3	1.5	10.6	2.5	6,940	12,490	2,120	123.
			2	......	42.0	47.1	10.9	3.9	5.1	71.4	1.6	7.1	......	7,254	13,060	......	
			3	......	47.2	52.8	......	4.4	5.7	80.1	1.8	8.0	......	8,139	14,650	......	
Buffalo mine, Upper Freeport bed...............	110	D	1	4.0	34.8	56.3	4.9	.8	......	......	......	......	......	......	......	......	O. Vol. 5.
			2	......	36.2	58.7	5.1	.8	......	......	......	......	......	......	......	......	
1 mile southeast of, sec. 11; Waldhoning mine No. 2, Upper Freeport bed (600 feet southeast of shaft).	20245	B	1	6.9	34.1	53.2	5.8	.8	......	......	......	......	4.2	7,106	12,790	2,460	123.
Same (3,400 feet northwest of shaft)..........	20246	B	1	6.3	36.2	52.2	5.3	.9	......	......	......	......	3.6	7,222	13,000	2,570	123.
Same (composite of samples 20245 and 20246).	20247	B	1	6.5	35.4	52.6	5.5	.9	5.5	73.4	1.4	13.3	3.9	7,189	12,940	......	123.
			2	......	37.9	56.2	5.9	.9	5.1	78.5	1.5	8.1	......	7,689	13,840	......	
			3	......	40.3	59.7	......	1.0	5.4	83.4	1.6	8.6	......	8,172	14,710	......	
Lore City, 1 mile west of; Black Top mine, Upper Freeport bed (23 east entry, main south entry 6,200 feet southeast of shaft).	20264	B	1	6.1	35.2	51.8	6.9	1.6	......	......	......	......	3.8	7,078	12,740	2,300	123.
Same (near end of main south entry, 7,300 feet southwest of shaft).	20265	B	1	6.0	35.7	50.3	8.0	2.2	......	......	......	......	3.4	7,033	12,660	2,280	123.
Same (composite of samples 20264 and 20265).....	20266	B	1	6.1	35.0	51.6	7.3	2.0	5.4	71.3	1.4	12.6	3.6	7,061	12,710	......	123.
			2	......	37.3	54.9	7.8	2.1	5.0	75.8	1.5	7.9	......	7,517	13,530	......	
			3	......	40.5	59.5	......	2.3	5.4	82.3	1.6	8.4	......	8,156	14,680	......	
Quaker City, 1½ miles northwest of; Samuel Sayre mine, Pittsburgh bed (250 feet east of mine mouth).	20178	B	1	4.4	41.1	45.8	8.7	4.9	5.4	69.3	1.3	10.4	2.2	7,061	12,710	2,180	123.
			2	......	43.0	47.9	9.1	5.1	5.1	72.5	1.3	6.9	......	7,383	13,290	......	
			3	......	47.4	52.6	......	5.6	5.6	79.8	1.5	7.5	......	8,128	14,630	......	
Senecaville, ¼ mile southeast of; Cleveland mine, Upper Freeport bed (face of 5 room, east entry, main north entry, 5,000 feet east of shaft).	20261	B	1	5.4	35.8	50.7	8.1	1.6	......	......	......	......	3.2	7,100	12,780	2,460	123.
Same (face of 3 north entry, 10,500 feet north of shaft).	20262	B	1	6.4	33.7	52.1	7.8	2.2	......	......	......	......	4.1	7,017	12,630	2,330	123.
Same (composite of samples 20261 and 20262).....	20263	B	1	6.0	34.2	52.0	7.8	2.0	5.4	71.4	1.3	12.1	3.7	7,067	12,720	......	123.
			2	......	36.4	55.3	8.3	2.1	5.0	75.9	1.4	7.3	......	7,517	13,530	......	
			3	......	39.7	60.3	......	2.3	5.5	82.8	1.5	7.9	......	8,200	14,760	......	
HARRISON COUNTY.																	
Athens Twp., N. E. ¼ sec. 1; John Edwards land, Pittsburgh bed.	21	D	1	6.0	34.4	53.6	6.0	1.4	5.4	72.2	1.3	13.7	......	7,200	12,960	......	O. 9.
			2	......	36.5	57.1	6.4	1.4	5.1	76.8	1.4	8.9	......	7,661	13,790	......	
			3	......	39.0	61.0	......	1.5	5.4	82.0	1.5	9.6	......	8,178	14,720	......	
Cadiz, Cadiz Twp.; Glover Coal Co. mine, Pittsburgh bed.	20	D	1	3.8	36.7	48.6	10.9	4.4	5.1	67.7	1.3	10.6	......	6,867	12,360	......	O. 9.
			2	......	38.2	50.5	11.3	4.6	4.9	70.4	1.3	7.5	......	7,139	12,850	......	
			3	......	43.0	57.0	......	5.1	5.5	79.4	1.5	8.5	......	8,050	14,490	......	
Flushing (Belmont County), 2 miles north of; Dunlap mine, Meigs Creek bed.	4056	B	1	5.5	36.0	49.8	8.7	2.3	......	......	......	......	2.4	......	......	......	22.
			2	......	38.1	52.7	9.2	2.4	......	......	......	......	......	......	......	......	
New Athens, 1 mile west of; Joshua Kirkland, Meigs Creek bed.	35	D	1	5.4	33.1	51.2	10.3	2.2	5.2	68.7	1.3	12.3	......	6,883	12,390	......	O. 9.
			2	......	35.0	54.1	10.9	2.3	4.9	72.6	1.3	8.0	......	7,272	13,090	......	
			3	......	39.2	60.8	......	2.6	5.5	81.4	1.5	9.0	......	8,161	14,690	......	

Table 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
HOCKING COUNTY.																	
Green Twp., sec. 1; Haydenville mine, Middle Kittanning bed.	80	D	1	6.6	37.3	49.1	7.0	2.6	5.5	68.4	1.2	15.3	......	6,900	12,420	......	O. 9.
			2	......	39.9	52.6	7.5	2.8	5.1	73.2	1.3	10.1	......	7,383	13,290	......	
			3	......	43.1	56.9	......	3.0	5.5	79.1	1.4	11.0	......	7,978	14,360	......	
Jackson, 5 miles west of; Decatur No. 1 mine, Sharon No. 1 bed (face of 4 room, 3 left heading, 650 feet northwest of mine mount).	15188	A	1	13.6	31.8	50.4	4.2	.9	......	......	......	......	3.2	6,489	11,680	......	22.
			2	......	36.8	58.3	4.9	1.0	......	......	......	......	......	7,511	13,520	......	
Same (face of 10 room, 1 left entry, 600 feet northwest of mine mouth).	15189	A	1	12.8	31.5	47.9	7.8	1.0	......	......	......	......	2.8	6,261	11,270	......	22.
			2	......	36.1	55.0	8.9	1.1	......	......	......	......	......	7,178	12,920	......	
Jobs, secs. 2 and 8, T. 13; R. 15: No. 2 mine, Middle Kittanning bed (second breakthrough between 3 and 4 rooms, 4 west entry, 3 south entry).	7712	D	1	9.7	32.4	53.5	4.4	.5	5.7	69.5	1.3	18.6	5.5	6,806	12,250	......	22.
			2	......	35.9	59.2	4.9	.6	5.1	77.0	1.4	11.0	......	7,539	13,570	......	
			3	......	37.8	62.2	......	.6	5.4	81.0	1.5	11.5	......	7,928	14,270	......	
Starr Twp., sec. 22; J. W. Washburn mine, Middle Kittanning bed.	81	D	1	6.5	38.3	47.2	8.0	3.5	5.5	67.3	1.2	14.5	......	6,850	12,330	......	O. 9.
			2	......	41.0	50.4	8.6	3.8	5.1	72.0	1.3	9.2	......	7,328	13,190	......	
			3	......	44.8	55.2	......	4.1	5.6	78.8	1.4	10.1	......	8,017	14,430	......	
Ward Twp., secs. 4 and 5; Continental Coal Co. mine, Middle Kittanning bed.	86	D	1	7.6	34.0	52.5	5.9	.8	5.5	70.1	1.4	16.3	......	6,950	12,510	......	O. 9.
			2	......	36.8	56.9	6.3	.8	5.1	75.8	1.5	10.5	......	7,517	13,530	......	
			3	......	39.3	60.7	......	.9	5.4	80.9	1.6	11.2	......	8,028	14,450	......	
Sec. 7; New Pittsburgh mine, Middle Kittanning bed.	87	D	1	7.5	35.0	52.7	4.8	.7	5.5	71.0	1.4	16.6	......	7,056	12,700	......	O. 9.
			2	......	37.8	57.0	5.2	.7	5.1	76.8	1.6	10.6	......	7,628	13,730	......	
			3	......	39.9	60.1	......	.8	5.4	81.0	1.6	11.2	......	8,044	14,480	......	
Green & Hite mine, Middle Kittanning bed.....	88	D	1	7.4	34.2	53.4	5.0	1.1	5.6	70.6	1.3	16.4	......	7,028	12,650	......	O. 9.
			2	......	36.9	57.7	5.4	1.1	5.1	76.2	1.4	10.8	......	7,589	13,660	......	
			3	......	39.0	61.0	......	1.2	5.4	80.6	1.5	11.3	......	8,022	14,440	......	
HOLMES COUNTY.																	
Hardy Twp.; Bowen Bros. mine, Middle Kittanning bed (average of bed).	4	D	1	5.4	42.4	45.4	6.8	4.7	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	44.8	48.0	7.2	5.0	......	......	......	......	......	......	......	......	
Elias Mast mine, Lower Mercer bed............	11	D	1	5.1	41.0	47.2	6.7	2.9	......	......	......	......	......	......	......	......	O. Vol. V
			2	......	43.2	49.7	7.1	3.1	......	......	......	......	......	......	......	......	
Monroe Twp.; S. R. Williams' mine, Sharon bed (average upper and lower bench).	....	D	1	6.1	41.6	47.8	4.5	2.2	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	44.3	50.9	4.8	2.3	......	......	......	......	......	......	......	......	
Millersburgh, 4 miles south of; Killbuck Twp.; Cary and Urmson mine, Middle Kittanning bed.	82	D	1	5.5	42.0	44.6	7.9	3.9	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	44.5	47.2	8.3	4.1	......	......	......	......	......	......	......	......	
Salt Creek Twp.; John Amsbaugh mine, Upper Mercer bed.	78	D	1	3.8	43.5	42.7	10.0	5.0	......	......	......	......	......	......	......	......	O. Vol.V.
			2	......	45.2	44.5	10.3	5.2	......	......	......	......	......	......	......	......	

Walnut Creek Twp.; A. Scar mine, Middle Kittanning bed (upper and lower bench).	......	D	1	5.6	40.5	49.9	4.0	2.5	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.9	52.8	4.3	2.6	......	......	......	......	......	......	......	......	
Andrew Schrock's mine, Lower Kittanning bed.	84	D	1	4.5	42.5	47.3	5.7	3.4	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	44.5	49.5	6.0	3.6	......	......	......	......	......	......	......	......	
Sec. 24; Michael Zalmer mine, Middle Kittanning bed (weathered coal).	119	D	1	7.3	34.9	53.6	4.2	1.0	5.4	70.6	1.4	17.4	......	6,950	12,510	......	O. 9.
			2	......	37.7	57.8	4.5	1.1	5.0	76.2	1.6	11.6	......	7,500	13,500	......	
			3	......	39.5	60.5	......	1.1	5.2	79.8	1.6	12.3	......	7,856	14,140	......	
JACKSON COUNTY.																	
Bloomfield Twp., sec. 32; Old Limestone Furnace mine, Clarion bed (300 feet from entry).	62	D	1	5.3	37.3	43.9	13.5	6.1	5.0	62.1	1.2	12.1	......	6,394	11,510	......	O 9.
			2	......	39.4	46.3	14.3	6.4	4.6	65.5	1.3	7.9	......	6,750	12,150	......	
			3	......	46.0	54.0	......	7.5	5.4	76.5	1.5	9.1	......	7,878	14,180	......	
Coalton; Southern Ohio Coal & Iron Co. mine, Quakertown bed.	150	D	1	7.5	36.4	54.9	1.2	.7	......	......	......	......	......	......	......	......	O. Vol. V. 2
			2	......	39.3	59.4	1.3	.7	......	......	......	......	......	......	......	......	
Milton Twp., Coal Run mine, Tionesta bed (cannel coal).	......	D	1	1.4	51.7	33.1	13.8	1.4	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	52.4	33.6	14.0	1.4	......	......	......	......	......	......	......	......	
Kitchen Station, Madison Twp.; Hall's mine, Clarion bed.	63	D	1	4.9	35.8	45.6	13.7	6.1	4.9	62.6	1.2	11.5	......	6,461	11,630	......	O. 9.
			2	......	37.6	48.0	14.4	6.5	4.6	65.8	1.3	7.4	......	6,794	12,230	......	
			3	......	43.9	56.1	......	7.6	5.3	76.9	1.5	8.7	......	7,939	14,290	......	
Lick Twp., sec. 9; Chapman's new mine, Quakertown bed.	......	D	1	8.9	34.0	52.6	4.5	1.0	......	......	......	......	......	......	......	......	O.Vol.V
			2	......	37.4	57.7	4.9	1.1	......	......	......	......	......	......	......	......	
Milton Twp., sec. 35; Iron Valley mine, Clarion bed (300 feet in entry).	55	D	1	5.6	38.9	47.4	8.1	3.7	5.5	67.3	1.3	14.1	......	6,861	12,350	......	O. 9.
			2	......	41.2	50.2	8.6	3.9	5.1	71.3	1.4	9.7	......	7,272	13,090	......	
			3	......	45.1	54.9	......	4.3	5.6	78.0	1.5	10.6	......	7,394	13,310	......	
Sec. 34; Minglewood mine, Brookville bed (upper branch).	......	D	1	9.3	36.8	47.8	6.1	2.0	5.7	67.8	1.3	17.1	4.9	6,789	12,220	......	O. 20.
			2	......	40.6	52.6	6.8	2.2	5.2	74.8	1.4	9.6	......	7,494	13,490	......	
			3	......	43.5	56.5	......	2.4	5.5	80.2	1.5	10.4	......	8,039	14,470	......	
Sec. 13; Superior Coal Co. mine, Clarion bed (new workings, 60 feet in entry).	56	D	1	5.0	39.7	45.5	9.8	4.1	5.4	66.1	1.3	13.3	......	6,800	12,240	......	O. 9.
			2	......	41.8	47.9	10.3	4.3	5.1	69.6	1.4	9.3	......	7,156	12,880	......	
			3	......	46.6	53.4	......	4.8	5.7	77.6	1.5	10.4	......	7,983	14,370	......	
Sec. 36; Superior Coal Co. mine, Clarion bed (80 feet in entry).	57	D	1	4.7	40.5	46.2	8.6	3.7	5.4	67.5	1.3	13.5	......	6,911	12,440	......	O. 9.
			2	......	42.5	48.5	9.0	3.9	5.2	70.9	1.3	9.7	......	7,256	13,060	......	
			3	......	46.7	53.3	......	4.3	5.7	77.9	1.5	10.6	......	7,972	14,350	......	
Sec. 24; No. 11 mine, Lower Kittanning bed (face of entry).	76	D	1	8.4	35.2	49.0	7.4	2.7	5.5	66.6	1.4	16.4	......	6,772	12,190	......	O. 9.
			2	......	38.4	53.5	8.1	2.9	5.0	72.7	1.5	9.8	......	7,394	13,310	......	
			3	......	41.8	58.2	......	3.1	5.4	79.1	1.6	10.8	......	8,044	14,480	......	
Sec. 4; Wainwright mine, Quakertown bed (face of 4 west, south entry).	......	D	1	9.3	33.0	54.2	3.5	1.3	5.6	71.0	1.4	17.2	......	6,961	12,530	......	O. 20.
			2	......	36.3	59.8	3.9	1.4	5.0	78.3	1.5	9.9	......	7,672	13,810	......	
			3	......	37.8	62.2	......	1.4	5.2	81.4	1.6	10.4	......	7,978	14,360	......	
Welston, 9 miles southeast of; No. 10 mine, Brookville (No. 4) bed (face of 16 room, 4 right entry, 1,400 feet southwest of mine mouth).	1896	A	1	8.5	41.3	43.5	6.7	3.1	......	......	......	......	4.9	6,806	12,250	......	22.
			2	......	45.1	47.5	7.4	3.4	......	......	......	......	......	7,433	13,380	......	
Same (face of 17 room, 4 right entry, 1,400 feet northeast of mine mouth).	1897	A	1	7.5	39.3	32.7	10.5	5.4	......	......	......	......	3.7	......	......	......	22.
			2	......	42.4	46.2	11.4	5.9	......	......	......	......	......	......	......	......	
Same, Lower Kittanning (No. 5) bed (face of 5 room, 2 right entry, south side, 800 feet southwest of mine mouth).	1898	A	1	9.4	36.7	46.3	7.6	4.1	......	......	......	......	5.6	6,611	11,900	......	22
			2	......	40.5	51.1	8.4	4.5	......	......	......	......	......	7,294	13,130	......	
Same (face of 7 room, 4 right entry, north side, 800 feet northeast of mine mouth).	1899	A	1	9.0	37.8	43.9	9.3	4.4	......	......	......	......	5.3	......	......	......	22.
			2	......	41.5	48.2	10.3	4.8	......	......	......	......	......	......	......	......	
Pittinger mine, Clarion bed	60	D	1	5.3	41.0	45.3	8.4	3.7	5.5	66.5	1.3	14.6	......	6,828	12,290	......	O. 9.
			2	......	43.3	47.8	8.9	3.9	5.2	70.3	1.4	10.3	......	7.211	12,980	......	
			3	......	47.5	52.5	......	4.3	5.7	77.1	1.5	11.4	......	7,911	14,240	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
JEFFERSON COUNTY.																	
Adena, Short Creek Twp.: Adena mine, Pittsburgh bed.	19	D	1	4.2	37.0	50.6	8.2	2.8	5.4	71.2	1.3	11.1	......	7,161	12,890	......	O. 9
			2	......	38.6.	52.8	8.6	3.0	5.1	74.3	1.3	7.7	......	7,472	13,450	......	
			3	......	42.2	57.8	......	3.2	5.6	81.3	1.4	8.5	......	8,172	14,710	......	
Amsterdam, 1 mile south of, sec. 18, T. 11 N., R. 4 W.; Amsterdam mine, Lower Freeport bed (center of face entry).	10533	A	1	3.4	37.6	52.0	7.0	2.4	......	......	......	......	1.4	......	......	2,190	85.
			2	......	38.9	53.8	7.3	2.5	......	......	......	......	......	......	......	......	
Same (face of 4 room, 4 east entry, east section, 1,000 feet northeast of shaft).	15388	B	1	3.7	37.4	51.2	7.7	3.1	......	......	......	......	1.6	7,344	13,220	2,060	85.
Same (face of 15 room, 9 west entry, sec. 2 N., 4,000 feet northwest of shaft).	15389	B	1	3.5	38.3	50.8	7.4	3.0	......	......	......	......	1.4	7,361	13,250	2,130	85.
Same (face of 8 west entry, sec. 3 S., 4,500 feet southwest of shaft).	15390	B	1	3.3	38.8	50.4	7.5	3.2	......	......	......	......	1.2	7,361	13,250	2,080	85.
Same (composite of samples 15388, 15389, and 15390).	15394	B	1	3.5	38.0	51.1	7.4	3.1	5.4	73.4	1.5	9.2	1.4	7,383	13,290	......	85.
			2	......	39.4	52.9	7.7	3.2	5.2	76.1	1.5	6.3	......	7,650	13,770	......	
			3	......	42.7	57.3	......	3.5	5.7	82.4	1.6	6.8	......	8,289	14,920	......	
Halfway between Bergholz and Amsterdam, sec. 8, T. 12 N., R. 4 W.; Eastern Ohio mine, Lower Freeport bed (face of 11 room, 12 west butt entry, 3,000 feet west of mine mouth).	15391	B	1	3.6	37.6	49.1	9.7	3.1	......	......	......	......	1.5	7,156	12,880	2,260	85.
Same (face of 13 west entry, south face entry)....	15392	B	1	3.5	38.6	49.6	8.3	2.4	......	......	......	......	1.5	7,344	13,220	2,130	85.
Same (face of 12 left butt entry, north face entry, 2,700 feet northeast of mine mouth).	15393	B	1	4.0	38.6	49.0	8.4	3.0	......	......	......	......	2.0	7,233	13,020	2,050	85.
Same (composite of samples 15391, 15392, and 15393).	15395	B	1	3.7	38.0	49.5	8.8	2.8	5.3	71.8	1.4	9.9	1.7	7,283	13,110	......	85.
			2	......	39.4	51.5	9.1	2.9	5.1	74.5	1.4	7.0	......	7,561	13,610	......	
			3	......	43.4	56.6	......	3.2	5.6	82.0	1.6	7.6	......	8,317	14,970	......	
2 miles east of, sec. 7, T. 12 N., R. 4 W.; Elizabeth mine, Lower Freeport bed (face of 22 room, 3 west entry, 2,600 feet northwest of shaft).	15440	B	1	3.4	38.0	52.4	6.2	2.2	......	......	......	......	1.7	7,517	13,530	2,210	85.
Same (face of 33 room, 2 south face entry, 2,400 feet west of shaft).	15441	B	1	3.5	37.9	50.7	7.9	3.1	......	......	......	......	1.4	7,367	13,260	2,170	85.
Same (composite of samples 15440 and 15441).....	15442	B	1	3.4	38.0	51.6	7.0	2.7	5.4	73.3	1.5	10.1	1.6	7,439	13,390	......	85.
			2	......	39.0	53.8	7.2	2.8	5.2	75.9	1.5	7.4	......	7,700	13,860	......	
			3	......	42.4	57.6	......	3.0	5.6	81.8	1.6	8.0	......	8,294	14,930	......	

Same (face of 6 room, 9 west entry, 2,600 feet north of shaft).	15443	B		1	3.6	37.0	50.7	8.7	3.7	......	......	......	......	1.8	7,222	13,000	2,120	85.
				2	......	38.4	52.5	9.1	3.8	......	......	......	......	......	7,494	13,490	......	
Bradley; Crow Hollow mine, Pittsburgh bed (face of 9 room, 4 left entry, 9 district, 3,000 feet northwest of tipple).	1910	A		1	4.1	38.5	49.6	7.8	3.7	......	......	......	......	1.7	7,306	13,150	......	22.
				2	......	40.1	51.8	8.1	3.8	......	......	......	......	......	7,611	13,700	......	
Same (face of 17 room, 2 main entry, 2 district).	1911	A		1	4.2	37.2	51.1	7.5	3.2	......	......	......	......	2.0	......	......	......	22.
				2	......	38.8	53.4	7.8	3.4	......	......	......	......	......	......	......	......	
Brilliant; Pittsburgh bed (prospect).	1577	B		1	5.3	34.9	49.1	10.7	3.1	......	......	......	......	2.9	......	......	......	22.
				2	......	36.8	51.9	11.3	3.2	......	......	......	......	......	......	......	......	
Dewland Cox & Son's mine, Pittsburgh bed.	16	D		1	4.9	33.1	51.5	10.5	4.1	5.0	68.0	1.1	11.3	......	6,956	12,520	......	O. 9.
				2	......	34.8	54.2	11.0	4.3	4.7	71.5	1.2	7.3	......	7,311	13,160	......	
				3	......	39.1	60.9	......	4.8	5.3	80.4	1.3	8.2	......	8,211	14,780	......	
1½ miles northwest of; Goucher No. 2 mine, Pittsburgh bed (face of 2 entry, north side of mine, 500 feet northwest of mine mouth).	15563	B		1	3.8	38.8	50.0	7.4	3.8	......	......	......	......	2.0	7,267	13,080	2,190	85.
Same (face of 1 room, 1 right entry, 500 feet northwest of mine mouth).	15564	B		1	4.3	37.4	50.3	8.0	3.7	......	......	......	......	2.5	7,200	12,960	2,170	85.
Same (composite of samples 15563 and 15564).	15565	B		1	4.1	38.0	50.2	7.7	3.8	5.2	71.7	1.4	10.2	2.3	7,228	13,010	......	85.
				2	......	39.6	52.4	8.0	4.0	5.0	74.8	1.5	6.7	......	7,539	13,570	......	
				3	......	43.1	56.9	......	4.4	5.4	81.3	1.6	7.3	......	8,200	14,760	......	
Brown's Station; William S. Finley mine, Brush Creek coal.	61	D		1	1.8	40.6	52.5	5.1	2.6	......	......	......	......	......	......	......	......	O. Vol. V.
				2	......	41.3	53.5	5.2	2.7	......	......	......	......	......	......	......	......	
Cream City; Cream City mine, Middle Kittanning bed (340 feet northeast of mine mouth).	25899	B		1	2.6	36.8	49.4	11.2	2.1	5.3	71.0	1.5	8.9	.7	7,156	12,880	2,410	193.
				2	......	37.8	50.7	11.5	2.1	5.1	73.0	1.5	6.8	......	7,350	13,230	......	
				3	......	42.6	57.4	......	2.4	5.8	82.4	1.7	7.7	......	8,306	14,950	......	
Dillonville, Mount Pleasant Twp.; Wheeling and Lake Erie No. 2 mine, Pittsburgh bed (face of new room).	12	D		1	3.1	37.9	49.5	9.5	3.8	5.2	69.6	1.1	10.8	......	7,156	12,880	......	O. 9.
				2	......	39.1	51.1	9.8	4.0	5.0	71.8	1.1	8.3	......	7,383	13,290	......	
				3	......	43.4	56.6	......	4.4	5.6	79.6	1.3	9.1	......	8,183	14,730	......	
Empire, 2½ miles southwest of; Culp's mine, Pittsburgh bed (275 feet southwest of mine mouth).	25784	B		1	3.2	38.1	49.3	9.4	4.0	......	......	......	......	1.0	7,189	12,940	2,150	193.
				2	......	39.4	50.9	9.7	4.2	......	......	......	......	......	7,422	13,360	......	
Georges Run, at mouth of, 1 mile west of Ohio River; Waughe's bank, Pittsburgh bed.	1576	B		1	6.6	34.5	50.3	8.6	2.5	......	......	......	......	3.8	......	......	......	22.
				2	......	36.9	53.9	9.2	2.7	......	......	......	......	......	......	......	......	
Hopedale, 2 miles southeast of; Parlett mine, Pittsburgh bed (face of 9 room, 2 west entry, south entry, 2,200 feet northeast of mine mouth).	15444	B		1	5.0	36.2	52.8	6.0	1.7	......	......	......	......	2.2	7,328	13,190	2,250	85.
Same (face of 2 north entry, 180 feet beyond 9 and 10 rooms, west entry, 400 feet northwest of mine mouth).	15445	B		1	4.3	37.1	49.1	9.5	3.8	......	......	......	......	2.6	7,072	12,730	2,160	85.
Same (composite of samples 15444 and 15445).	15446	B		1	4.7	36.6	50.8	7.9	2.8	5.3	71.7	1.4	10.9	2.4	7,194	12,950	......	85.
				2	......	38.4	53.3	8.3	2.9	5.0	75.2	1.4	7.2	......	7,544	13,580	......	
				3	......	41.9	58.1	......	3.2	5.4	82.0	1.6	7.8	......	8,228	14,810	......	
Irondale; Banfield Clay Co. mine, Lower Freeport bed (250 feet southwest of mine mouth).	25785	B		1	4.3	35.6	48.0	12.1	2.4	......	......	......	......	2.5	6,939	12,490	......	193.
				2	......	37.1	50.3	12.6	2.5	......	......	......	......	......	7,250	13,050	......	
Banfield Clay Co., No. 3 mine, Lower Kittanning bed (400 feet southeast of mine mouth).	25787	B		1	3.4	37.2	46.7	12.7	7.3	......	......	......	......	2.1	6,906	12,430	......	193.
				2	......	38.5	48.4	13.1	7.6	......	......	......	......	......	7,156	12,880	......	
East Ohio, No. 2 mine, Lower Kittanning bed (3,000 feet east of mine mouth).	25901	B		1	2.2	39.6	47.5	10.7	5.0	5.3	71.0	1.3	6.7	.7	7,239	13,030	1,960	193.
				2	......	40.5	48.6	10.9	5.1	5.1	72.7	1.4	4.8	......	7,400	13,320	......	
				3	......	45.5	54.5	......	5.7	5.8	81.5	1.5	5.5	......	8,306	14,950	......	
Nicholson coal bank, Upper Freeport bed (600 feet southwest of mine mouth).	25788	B		1	3.7	36.5	51.3	8.5	2.8	......	......	......	......	1.8	7,289	13,120	2,210	193.
				2	......	38.0	53.2	8.8	3.0	......	......	......	......	......	7,572	13,630	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
JEFFERSON COUNTY—continued.																	
Island Creek, 1 mile west of Ohio River; Country bank, Finley bed.	1574	B	1	3.9	36.5	52.2	7.4	3.6	......	......	......	......	1.9	......	......	......	22.
			2	......	37.9	54.4	7.7	3.8	......	......	......	......	......	......	......	......	
Linton; Diamond mine, Upper Freeport bed........	64	D	1	1.7	39.3	52.1	6.9	3.4	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	40.0	53.0	7.0	3.5	......	......	......	......	......	......	......	......	
New Alexandria, 1 mile north of; Scott's bank, Pittsburgh bed.	1575	B	1	5.2	34.7	50.6	9.5	2.4	......	......	......	......	2.8	......	......	......	22.
			2	......	36.6	53.4	10.0	2.5	......	......	......	......	......	......	......	......	
New Somerset, near, Knox Twp., sec. 16; local mine, Pittsburgh bed (150 feet southwest of mine mouth).	25786	B	1	3.4	37.9	48.7	10.0	3.9	......	......	......	......	1.4	7,178	12,920	2,170	193.
			2	......	39.2	50.5	10.3	4.1	......	......	......	......	......	7,428	13,370	......	
Piney Fork, 2 miles southwest of Smithfield, sec. 16; Cabbage Run mine, Pittsburgh bed (face of 26 room, 3 left entry, 1,050 feet northeast of mine mouth).	15491	B	1	5.5	35.7	54.2	4.6	.8	......	......	......	......	3.2	7,400	13,320	2,710	85.
			2	......	37.8	57.3	4.9	.9	......	......	......	......	......	7,828	14,090	......	85.
Same, sec. 21; Piney Fork No. 1 mine, Pittsburgh bed (face of 14 room, left entry, main east entry, 4,000 feet southwest of mine mouth).	15489	B	1	4.9	36.6	51.2	7.3	2.6	5.4	71.9	1.4	11.4	2.8	7,217	12,990	2,120	85.
			2	......	38.5	53.9	7.6	2.7	5.1	75.6	1.5	7.5	......	7,589	13,660	......	
			3	......	41.7	58.3	......	3.0	5.5	81.8	1.6	8.1	......	8,217	14,790	......	85.
Same, sec. 17; Piney Fork No. 2 mine, Pittsburgh bed (face of 28 room, 21 east entry, 5,600 feet northeast of mine mouth).	15490	B	1	5.5	35.8	53.2	5.5	.8	......	......	......	......	3.2	7,322	13,180	2,630	
			2	......	37.8	56.4	5.8	.8	......	......	......	......	......	7,750	13,950	......	
Rush Run; Rush Run No. 1 mine, Pittsburgh bed (face of 1 left entry, 2,400 feet southeast of mine mouth).	1944	A	1	4.7	35.6	53.7	6.0	1.5	......	......	......	......	2.4	7,406	13,330	......	22.
			2	......	37.3	56.4	6.3	1.6	......	......	......	......	......	7,767	13,980	......	
Same (face of 17 room, 3 entry, 2,600 feet south of mine mouth).	1945	A	1	5.0	35.3	54.0	5.7	1.0	......	......	......	......	2.2	......	......	......	22.
			2	......	37.2	56.8	6.0	1.0	......	......	......	......	......	......	......	......	
Smithfield, 2 miles east of, sec. 29; Plumb Run mine No. 1; Pittsburgh bed (face of 7 room, 7 east entry, 7 south face entry, 2,500 feet northeast of mine mouth).	15486	B	1	4.8	35.9	54.0	5.3	1.0	5.4	74.1	1.5	12.7	2.6	7,417	13,350	......	85.
			2	......	37.7	56.7	5.6	1.0	5.1	77.9	1.5	8.9	......	7,789	14,020	......	
			3	......	40.0	60.0	......	1.1	5.4	82.5	1.6	9.4	......	8,250	14,850	......	
Same, sec. 30; Plumb Run No. 4 mine, Pittsburgh bed (face of 14 room, 15 right entry, 4,400 feet northeast of mine mouth).	15487	B	1	4.5	36.4	51.1	8.0	3.3	......	......	......	......	2.6	7,156	12,880	......	85.
			2	......	38.1	53.5	8.4	3.5	......	......	......	......	......	7,494	13,490	......	
Same, sec. 29; Plum Run No. 5 mine, Pittsburgh bed (face of 3 room, 2 right entry, 1 right face entry, 1,800 feet southeast of mine mouth).	15488	B	1	4.3	36.6	52.1	7.0	2.6	......	......	......	......	2.3	7,306	13,150	2,160	85.
			2	......	38.2	54.5	7.3	2.7	......	......	......	......	......	7,633	13,740	......	

2 miles southeast of; Crow Hollow mine, Pittsburgh bed.	13	D	1	5.0	34.5	54.0	6.5	1.8	5.4	72.4	1.3	12.6	......	7,278	13,100	......	O. 9.
			2	......	36.3	56.9	6.8	1.8	5.1	76.2	1.4	8.7	......	7,656	13,780	......	
			3	......	39.0	61.0	......	2.0	5.4	81.8	1.5	9.3	......	8,217	14,790	......	
Steubenville, sec. 29; La Belle mine, Lower Freeport bed (face of 5 south butt entry, southeast entry, 4,400 feet southeast of shaft).	15676	B	1	3.8	35.4	53.4	7.4	1.9	......	......	......	......	1.5	7,344	13,220	2,300	85.
			2	......	36.8	55.5	7.7	2.0	......	......	......	......	......	7,633	13,740	......	
Same (face of 9 room, left entry, 2 south entry, 5,200 feet southeast of shaft).	15675	B	1	3.8	35.9	53.4	6.9	1.9	5.2	74.2	1.5	10.3	1.6	7,417	13,350	......	85.
			2	......	37.3	55.6	7.1	2.0	5.0	77.2	1.5	7.2	......	7,711	13,880	......	
			3	......	40.2	59.8	......	2.1	5.4	83.1	1.6	7.8	......	8,306	14,950	......	
Yellow Creek; Yellow Creek mine, Upper Creek bed (30 feet west of mine mouth).	25890	B	1	4.8	38.3	51.8	5.1	1.8	......	......	......	......	2.7	7,478	13,460	2,330	193.
			2	......	40.2	54.5	5.3	1.9	......	......	......	......	......	7,856	14,140	......	
Same (50 feet southwest of mine mouth)........	25891	B	1	3.4	36.3	49.6	10.7	5.5	5.2	69.7	1.4	8.5	1.5	7,067	12,720	2,140	193.
			2	......	37.6	51.3	1.1	5.2	4.9	72.1	1.4	5.3	......	7,317	13,170	......	
			3	......	42.3	57.7	......	5.9	5.6	81.2	1.6	5.7	......	8,233	14,820	......	
Yorkville, Warren Twp.; Ohio & Pittsburgh Co. mine, Pittsburgh bed.	15	D	1	3.1	37.9	50.8	8.2	4.0	5.4	71.0	1.3	10.1	......	7,233	13,020	......	O. 9.
			2	......	39.1	52.4	8.5	4.2	5.2	73.3	1.3	7.5	......	7,467	13,440	......	
			3	......	42.7	57.3	......	4.5	5.7	80.1	1.4	8.3	......	8,161	14,690	......	
Wayne Twp.; McFadden mine, Pittsburgh bed.....	17	D	1	5.1	35.9	51.0	8.0	2.6	5.3	70.7	1.3	12.1	......	7,150	12,870	......	O. 9.
			2	......	37.8	53.8	8.4	2.8	5.0	74.4	1.3	8.1	......	7,528	13,550	......	
			3	......	41.2	58.8	......	3.0	5.5	81.2	1.4	8.9	......	8,217	14,790	......	
LAWRENCE COUNTY.																	
Aid Twp., sec. 35; Thomas Bennet mine, Upper Freeport bed (both benches).	146	D	1	8.5	31.3	48.9	11.3	.9	5.1	65.2	1.3	16.2	......	6,406	11,530	......	O. 9.
			2	......	34.1	53.6	12.3	1.0	4.5	71.2	1.4	9.6	......	6,994	12,590	......	
			3	......	38.9	61.1	......	1.2	5.2	81.2	1.6	10.8	......	7,978	14,360	......	
Sec. 36; Haskins mine, Upper Freeport bed (lower bench).	145	D	1	8.4	31.8	51.6	8.2	1.3	5.2	66.9	1.3	17.1	......	6,594	11,870	......	O. 9.
			2	......	34.7	56.3	9.0	1.4	4.7	73.1	1.4	10.4	......	7,200	12,960	......	
			3	......	38.1	61.9	......	1.6	5.1	80.3	1.6	11.4	......	7,911	14,240	......	
Sec. 21; Walter Rose mine, Upper Freeport bed (lower bench).	144	D	1	7.9	32.9	47.0	12.2	2.7	5.1	63.0	1.3	15.7	......	6,306	11,350	......	O. 9.
			2	......	35.7	51.1	13.2	2.9	4.6	68.4	1.4	9.5	......	6,844	12,320	......	
			3	......	41.1	58.9	......	3.3	5.3	78.8	1.6	11.0	......	7,883	14,190	......	
Coalgrove, Perry Twp.; John Peter's mine, Lower Kittanning bed (1 mile from mine mouth).	74	D	1	7.6	38.5	45.1	8.8	3.2	5.6	66.7	1.3	14.4	......	6,778	12,200	......	O. 9.
			2	......	41.7	48.8	9.5	3.5	5.1	72.2	1.4	8.3	......	7,333	13,200	......	
			3	......	46.0	54.0	......	3.8	5.7	79.8	1.5	9.2	......	8,106	14,590	......	O. 9.
Decatur Twp., sec. 15; Isaac Hall mine, Clarion bed (½ mile from mine mouth).	68	D	1	6.1	38.4	45.6	9.9	3.6	5.4	65.5	1.2	14.4	......	6,644	11,960	......	O. 9.
			2	......	40.9	48.5	10.6	3.8	5.1	69.8	1.3	9.4	......	7,078	12,740	......	
			3	......	45.8	54.2	......	4.3	5.7	78.1	1.5	10.4	......	7,911	14,240	......	O. 9.
Olive Station; McGugin & Co. mine, Clarion bed (fresh face).	67	D	1	5.9	37.3	41.5	15.3	5.4	5.1	60.2	1.2	12.8	......	6,183	11,130	......	
			2	......	39.6	44.2	16.2	5.7	4.7	64.0	1.3	8.1	......	6,572	11,830	......	
			3	......	47.2	52.8	......	6.8	5.6	76.4	1.5	9.7	......	7,844	14,120	......	
Same (old entry, weathered coal)................	65	D	1	6.3	35.3	41.0	17.4	5.2	4.9	57.9	1.1	13.5	......	5,967	10,740	......	O. 9.
			2	......	37.7	43.7	18.6	5.7	4.5	61.8	1.1	8.3	......	6,372	11,470	......	
			3	......	46.3	53.7	......	6.9	5.5	76.0	1.4	10.2	......	7,828	14,090	......	
Etna Station, Elizabeth Twp.; Halley No. 1 mine, Lower Kittanning bed (1,500 feet from mine mouth).	75	D	1	8.1	34.5	47.7	9.7	2.1	5.4	65.5	1.2	16.1	......	6,628	11,930	......	O. 9.
			2	......	37.6	51.8	10.6	2.3	4.9	71.3	1.3	9.6	......	7,206	12,970	......	
			3	......	42.0	58.0	......	2.6	5.5	79.7	1.5	10.7	......	8,061	14,510	......	
Lawrence Twp., sec. 16; Frank Kitts mine, Upper Freeport bed (lower bench).	147	D	1	7.2	32.3	49.8	10.7	2.3	5.0	65.0	1.3	15.7	......	6,556	11,800	......	O. 9.
			2	......	34.8	53.7	11.5	2.5	4.6	70.1	1.4	9.9	......	7,067	12,720	......	
			3	......	39.3	60.7	......	2.8	5.2	79.2	1.5	11.3	......	7,983	14,370	......	
Sheridan; G. L. Chatfield mine, Middle Kittanning bed (300 feet from mine mouth).	82a	D	1	6.6	34.3	48.2	10.9	3.3	5.2	65.0	1.2	14.4	......	6,628	11,930	......	O. 9.
			2	......	36.7	51.6	11.7	3.6	4.7	69.6	1.3	9.1	......	7,100	12,780	......	
			3	......	41.6	58.4	......	4.0	5.4	78.8	1.5	10.3	......	8,039	14,470	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
LAWRENCE COUNTY—continued.																	
Symmes Twp., sec. 24 or 25; Cooper's mine, Upper Freeport bed (lower bench).	140	D	1	7.1	33.7	50.3	8.9	1.3	5.3	67.1	1.3	16.1	......	6,717	12,090	......	O. 9.
			2	......	36.2	54.2	9.6	1.4	4.9	72.2	1.3	10.6	......	7,233	13,020	......	
			3	......	40.1	59.9	......	1.6	5.4	79.9	1.5	11.6	......	8,000	14,400	......	
Sec. 23; G. W. Peach mine, Upper Freeport bed (both benches).	141	D	1	8.8	31.7	50.8	8.7	.8	5.3	66.9	1.3	17.0	......	6,583	11,850	......	O. 9.
			2	......	34.8	55.6	9.6	.8	4.8	73.3	1.4	10.1	......	7,217	12,990	......	
			3	......	38.4	61.6	......	.9	5.3	81.1	1.5	11.2	......	7,978	14,360	......	
Sec. 26 or 27; William Sneed mine, Upper Freeport bed (fresh face of entry)	143	D	1	8.4	31.5	50.0	10.1	1.8	5.2	64.9	1.3	16.7	......	6,500	11,700	......	O. 9.
			2	......	34.3	54.7	11.0	2.0	4.6	70.8	1.4	10.2	......	7,094	12,770	......	
			3	......	38.6	61.4	......	2.3	5.2	79.6	1.6	11.3	......	7,967	14,340	......	
Washington Twp., sec. 23; J. R. Edward's mine, Clarion bed (75 feet in entry).	66	D	1	6.0	39.2	42.9	11.9	5.1	5.3	63.3	1.2	12.2	......	6,517	11,730	......	O. 9.
			2	......	41.7	45.7	12.6	5.4	4.9	67.4	1.3	8.4	......	6,933	12,480	......	
			3	......	47.7	52.3	......	6.2	5.6	77.1	1.5	9.6	......	7,939	14,290	......	
MAHONING COUNTY.																	
Washingtonville, Green Twp.; J. D. Smith mine, Lower Kittanning bed (1,000 feet from mine mouth).	77a	D	1	5.2	36.9	53.2	4.7	2.2	5.5	73.8	1.4	12.4	......	7,500	13,500	......	O. 9.
			2	......	38.9	56.1	5.0	2.3	5.2	77.9	1.5	8.1	......	7,917	14,250	......	
			3	......	40.9	59.1	......	2.4	5.5	82.0	1.6	8.5	......	8,333	15,000	......	
MEDINA COUNTY.																	
Wadsworth, sec. 1; Excelsior mine, Sharon bed......	87	D	1	6.1	37.0	51.0	5.9	1.7	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	39.4	54.3	6.3	1.8	......	......	......	......	......	......	......	......	
1¼ miles east of; Silver Creek shaft No. 2 mine, Sharon bed.	88	D	1	5.4	38.2	49.8	6.6	1.9	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	40.4	52.6	7.0	2.0	......	......	......	......	......	......	......	......	
MEIGS COUNTY.																	
Rutland, 1 mile south of; Maynard Bros. mine, Pomeroy coal.	32	D	1	7.6	33.3	48.2	10.9	1.8	5.2	65.3	1.0	15.8	......	6,511	11,720	......	O. 9.
			2	......	36.1	52.1	11.8	2.0	4.7	70.7	1.1	9.7	......	7,050	12,690	......	
			3	......	40.9	59.1	......	2.3	5.3	80.2	1.3	10.9	......	7,994	14,390	......	
Hobson Station, Salisbury Twp., W. D. Edward's mine, Pomeroy coal.	31	D	1	5.5	38.2	45.7	10.6	4.2	5.4	65.6	1.0	13.2	......	6,661	11,990	......	O. 9.
			2	......	40.4	48.4	11.2	4.4	5.1	69.4	1.0	8.9	......	7,050	12,690	......	
			3	......	45.5	54.5	......	5.0	5.7	78.1	1.1	10.1	......	7,939	14,290	......	
Pomeroy; near Logan mine, Pomeroy coal..........	30	D	1	7.2	32.8	50.7	9.3	1.3	5.4	66.5	1.1	16.4	......	6,667	12,000	......	O. 9.
			2	......	35.4	54.6	10.0	1.4	5.0	71.6	1.2	10.8	......	7,189	12,940	......	
			3	......	39.3	60.7	......	1.6	5.5	79.6	1.3	12.0	......	7,989	14,380	......	

Peacock Coal Co. mine, Pomeroy coal	29	D	1	7.3	34.6	49.4	8.7	2.1	5.5	66.7	1.1	15.9	......	6,728	12,110	......	O. 9.
			2	......	37.3	53.3	9.4	2.2	5.1	72.0	1.1	10.2	......	7,256	13,060	......	
			3	......	41.2	58.8	......	2.4	5.6	71.4	1.3	11.3	......	8,011	14,420	......	
Syracuse, Sutton Twp.; W. F. Bartels mine, Pomeroy coal.	33	D	1	4.9	36.3	46.3	12.5	2.9	5.3	65.3	1.2	12.8	......	6,622	11,920	......	O. 9.
			2	......	38.1	48.7	13.2	3.1	5.0	68.6	1.2	8.9	......	6,961	12,530	......	
			3	......	43.9	56.1	......	3.6	5.8	79.0	1.4	10.2	......	8,017	14,430	......	
MONROE COUNTY.																	
Coats Station, 2½ miles east of, sec. 31; Charles Mobley mine, Uniontown bed (40 feet east of mine mouth).	20259	B	1	4.9	35.9	43.9	15.3	4.0	4.9	63.6	1.2	11.0	2.7	6,411	11,540	2,290	123.
			2	......	37.8	46.1	16.1	4.2	4.6	66.8	1.3	7.0	......	6,739	12,130	......	
			3	......	45.0	55.0	......	5.0	5.4	79.7	1.5	8.4	......	8,033	14,460	......	
MORGAN COUNTY.																	
Bloom Twp., SW. ¼; sec. 26; William Barkhurst's land, Meigs Creek bed.	176	D	1	3.7	40.4	43.4	12.5	5.7	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.0	45.0	13.0	6.0	......	......	......	......	......	......	......	......	
Bristol Twp., NE. ¼ sec. 21; D. C. Lawrence farm, Meigs Creek bed.	48	D	1	5.1	37.8	46.7	10.4	4.3	5.1	67.0	.9	12.3	......	6,728	12,110	......	O. 9.
			2	......	39.8	49.3	10.9	4.5	4.8	70.6	.9	8.3	......	7,089	12,760	......	
			3	......	44.7	55.3	......	5.1	5.4	79.3	1.1	9.1	......	7,956	14,320	......	
Center Twp., E. ½ of SW. ¼ sec. 28; John Wainwright land, Meigs Creek bed.	175	D	1	3.0	40.8	45.8	10.4	5.4	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.1	47.2	10.7	5.5	......	......	......	......	......	......	......	......	
SE. ¼ of SW. ¼ sec. 9; R. W. Coombs land, Meigs Creek bed.	174	D	1	2.4	41.7	43.3	12.6	5.7	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.7	44.4	12.9	5.8	......	......	......	......	......	......	......	......	
Hooksburgh, Windsor Twp., lot 75; James Noyce land, Meigs Creek bed.	192	D	1	3.9	40.8	46.6	8.7	4.0	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.5	48.4	9.1	4.2	......	......	......	......	......	......	......	......	
Manchester Twp., SW. ¼ sec. 29; L. H. Grandstaff mine, Meigs Creek bed.	49	D	1	4.1	37.6	47.6	10.7	5.1	5.1	66.2	.9	12.0	......	6,778	12,200	......	O. 9.
			2	......	39.2	49.7	11.1	5.3	4.9	69.0	.9	8.8	......	7,067	12,720	......	
			3	......	44.1	55.9	......	6.0	5.5	77.6	1.0	9.9	......	7,950	14,310	......	
Morgan Twp., NW. ¼ sec. 35; Abram Farris land, Pittsburgh bed.	179	D	1	4.2	38.7	43.8	13.3	5.4	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	40.3	45.8	13.9	5.6	......	......	......	......	......	......	......	......	
SE. ¼ sec. 19; E. Sherwood land, Pittsburgh bed.	191	D	1	3.9	36.7	42.4	17.0	5.2	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	38.2	44.1	17.7	5.4	......	......	......	......	......	......	......	......	
SW. ¼ sec. 36; R. Whipple's bank, Pittsburgh bed.	178	D	1	3.8	40.6	43.9	11.7	5.7	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.1	45.8	12.1	5.9	......	......	......	......	......	......	......	......	
MUSKINGUM COUNTY.																	
Adams Twp., sec. 3; C. H. Wilcox mine, Middle Kittanning bed (new room).	......	D	1	5.6	44.7	44.9	4.8	3.3	5.7	71.4	1.3	13.5	1.9	7,206	12,970	2,110	O. 21.
			2	......	47.4	47.5	5.1	3.5	5.4	75.7	1.3	9.0	......	7,633	13,740	......	
			3	......	49.9	50.1	......	3.7	5.7	79.3	1.4	9.4	......	8,050	14,490	......	
Blue Rock Twp., N. ½ sec. 35; Rosa Young land, Meigs Creek bed.	......	D	1	5.2	40.1	41.6	13.1	5.1	5.2	63.3	.9	12.4	2.0	6,428	11,570	2,280	O. 21.
			2	......	42.3	43.8	13.9	5.4	4.9	66.7	.9	8.2	......	6,778	12,200	......	
			3	......	49.1	50.9	......	6.2	5.7	77.4	1.1	9.6	......	7,867	14,160	......	
Brush Creek Twp.; Maynard Bros. mine, Upper Freeport bed.	149	D	1	4.7	43.5	44.2	7.6	5.0	5.6	68.3	1.3	12.2	......	7,044	12,680	......	O. 9.
			2	......	45.6	46.5	7.9	5.3	5.3	71.7	1.4	8.4	......	7,394	13,310	......	
			3	......	49.6	50.4	......	5.7	5.7	77.8	1.5	9.3	......	8,033	14,460	......	
Sec. 13; Walnut Hill mine, Middle Kittanning bed.	101	D	1	5.1	39.8	45.3	9.8	5.5	5.3	65.7	1.1	12.6	......	6,800	12,240	......	O. 9.
			2	......	41.9	47.8	10.3	5.8	5.0	69.3	1.2	8.4	......	7,167	12,900	......	
			3	......	46.7	53.3	......	6.5	5.6	77.2	1.3	9.4	......	7,989	14,380	......	
Cannelville, east of; George Helriggle mine, Middle Kittanning bed.	......	D	1	5.7	44.4	42.8	7.1	4.4	5.6	68.4	1.0	13.5	2.1	6,978	12,560	2,120	O. 21.
			2	......	47.0	45.4	7.6	4.7	5.3	72.4	1.1	8.9	......	7,400	13,320	......	
			3	......	50.9	49.1	......	5.1	5.7	78.4	1.2	9.6	......	8,006	14,410	......	
Chandlerville, Salt Creek Twp.; George Mokey mine; Anderson coal.	......	D	1	6.6	39.8	45.0	8.6	2.1	5.6	68.9	1.3	13.5	3.3	6,856	12,340	......	O. 21.
			2	......	42.7	48.1	9.2	2.2	5.2	73.8	1.4	8.2	......	7,339	13,210	......	
			3	......	47.0	53.0	......	2.5	5.7	81.3	1.6	8.9	......	8,083	14,550	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
MUSKINGUM COUNTY—continued.																	
Coaldale, south of, Hopewell Twp.; G. L. Porter mine, Clarion bed.	......	D	1	6.9	41.5	42.0	8.7	3.0	5.6	67.3	1.2	14.2	2.3	6,706	12,070	2,110	O. 21.
			2	......	44.6	46.1	9.3	3.2	5.2	72.3	1.3	8.7	......	7,200	12,960	......	
			3	......	49.2	50.8	......	3.6	5.7	79.7	1.4	9.6	......	7,944	14,300	......	
Frazeysburg, 1½ miles north of, Cass Twp.; Henry Norman mine, Quakertown bed.	......	D	1	9.8	35.1	49.1	6.0	1.4	5.8	68.8	1.2	16.8	3.2	6,744	12,140	2,660	O. 21.
			2	......	38.9	54.5	6.6	1.5	5.2	76.3	1.3	9.1	......	7,478	13,460	......	
			3	......	41.7	58.3	......	1.6	5.6	81.7	1.4	9.7	......	8,011	14,420	......	
Fultonham, west of, Newton Twp.; L. G. Harkness mine, Lower Kittanning bed.	......	D	1	8.0	39.2	46.8	6.0	2.4	5.5	68.4	1.4	16.3	2.6	6,894	12,410	......	O. 21.
			2	......	42.6	50.9	6.5	2.6	5.1	74.3	1.5	10.0	......	7,489	13,480	......	
			3	......	45.5	54.5	......	2.8	5.4	79.5	1.6	10.7	......	8,011	14,420	......	
Harrison Twp.; Blue Rock Coal Co. mine, Upper Freeport bed.	148	D	1	4.9	42.4	49.9	7.8	4.4	5.5	67.7	1.2	13.4	......	6,944	12,500	......	O. 9.
			2	......	44.5	47.3	8.2	4.6	5.3	71.2	1.2	9.5	......	7,300	13,140	......	
			3	......	48.5	51.5	......	5.0	5.7	77.6	1.3	10.4	......	7,950	14,310	......	
Southern part of abandoned quarries on Cedar Run, Anderson coal.	......	D	1	5.7	42.7	39.9	11.7	4.9	5.3	63.6	1.0	13.5	2.7	6,578	11,840	2,200	O. 21.
			2	......	45.3	42.3	12.4	5.2	5.0	67.4	1.1	8.9	......	6,972	12,550	......	
			3	......	51.7	48.3	......	5.9	5.7	77.0	1.2	10.2	......	7,961	14,330	......	
Sec. 11; T. Olden mine, Upper Freeport bed......	......	D	1	4.3	45.6	41.1	9.0	5.2	5.4	68.0	1.1	11.3	1.2	6,967	12,540	2,080	O. 21.
			2	......	47.7	42.9	9.4	5.5	5.1	71.0	1.2	7.8	......	7,278	13,100	......	
			3	......	52.6	47.4	......	6.0	5.7	78.4	1.3	8.6	......	8,039	14,470	......	
Sec. 30 or 31; Wesley Wells mine, Middle Kittanning bed.	100	D	1	4.7	40.3	45.2	9.8	4.1	5.4	67.7	1.2	11.8	......	6,872	12,370	......	O. 9.
			2	......	42.3	47.4	10.3	4.3	5.1	71.0	1.2	8.1	......	7,211	12,980	......	
			3	......	47.2	52.8	......	4.8	5.7	79.2	1.4	8.9	......	8,039	14,470	......	
Licking Twp., northeast corner of; Max Frazier mine, Bedford coal.	......	D	1	5.6	39.5	44.9	10.0	2.8	5.3	67.4	1.3	13.2	1.6	6,717	12,090	2,660	O. 21.
			2	......	41.8	47.6	10.6	3.0	5.0	71.3	1.3	8.8	......	7,117	12,810	......	
			3	......	46.8	53.2	......	3.3	5.6	79.8	1.5	9.8	......	7,961	14,330	......	
Madison Twp.; E. R. Birkhimer mine, Middle Kittanning bed.	102	D	1	4.8	39.9	46.0	9.3	5.4	5.4	66.7	1.3	11.9	......	6,856	12,340	......	O. 9.
			2	......	41.9	48.4	9.7	5.6	5.1	70.0	1.3	8.3	......	7,194	12,950	......	
			3	......	46.4	53.6	......	6.2	5.6	77.6	1.5	9.1	......	7,972	14,350	......	
E. V. Farrell mine, Middle Kittanning bed......	103	D	1	4.6	41.0	47.8	6.6	4.5	5.5	69.6	1.3	12.5	......	7,128	12,830	......	O. 9.
			2	......	42.9	50.2	6.9	4.7	5.2	73.0	1.4	8.8	......	7,472	13,450	......	
			3	......	46.1	53.9	......	5.1	5.6	78.4	1.5	9.4	......	8,028	14,450	......	
Northeast portion of, near Ross School; James Scott property, Middle Kittanning bed.	......	D	1	6.1	44.3	44.4	5.2	3.6	5.8	70.0	1.2	14.2	2.2	7,106	12,790	......	O. 21.
			2	......	47.1	47.4	5.5	3.9	5.4	74.6	1.3	9.3	......	7,572	13,630	......	
			3	......	49.9	50.1	......	4.1	5.7	79.0	1.4	9.8	......	8,017	14,430	......	

¾ mile east of Salem School; Harvey Smoots mine, Lower Freeport bed.	....	D	1	5.4	44.5	43.2	6.9	2.1	5.9	70.0	1.4	13.7	1.9	7,094	12,770	2,170	O. 21.
			2	......	47.0	45.7	7.3	2.2	5.6	74.0	1.5	9.4	......	7,500	13,500	....	
			3	......	50.6	49.4	......	2.4	6.0	79.8	1.6	10.2	......	8,089	14,560	....	
Monroe Twp., sec. 1; W. B. Eltringham mine, Middle Kittanning bed (150 feet in entry).	....	D	1	5.9	43.8	46.5	3.8	3.0	5.7	72.2	1.3	14.0	1.9	7,306	13,150	....	O. 21.
			2	......	46.6	49.4	4.0	3.2	5.4	76.7	1.4	9.3	......	7,767	13,980	....	
			3	......	48.5	51.5	......	3.3	5.6	79.9	1.4	9.8	......	8,089	14,560	....	
Muskingum Twp.; A. W. Smith mine, Middle Kittanning bed.	104	D	1	5.6	40.3	48.9	5.2	3.6	5.6	70.5	1.3	13.8	......	7,189	12,940	....	O. 9.
			2	......	42.6	51.9	5.5	3.8	5.2	74.7	1.3	9.5	......	7,617	13,710	....	
			3	......	45.1	54.9	......	4.1	5.6	79.1	1.4	9.8	......	8,061	14,510	....	
Newton Twp., sec. 14; Burton Townsend Co. Monitor mine, Middle Kittanning bed.	96	D	1	5.0	38.2	47.2	9.6	6.0	5.3	65.9	1.1	12.1	......	6,756	12,160	....	O. 9.
			2	......	40.2	49.7	10.1	6.3	5.0	69.4	1.2	8.0	......	7,117	12,810	....	
			3	......	44.7	55.3	......	7.0	5.5	77.1	1.3	9.1	......	7,911	14,240	....	
Otsego, 1 mile north of; George Buker mine, Middle Kittanning bed (150 feet from mine mouth).	....	D	1	5.5	44.7	45.2	4.6	3.5	5.7	70.9	1.1	14.2	1.9	7,239	13,030	....	O. 21.
			2	......	47.3	47.8	4.9	3.7	5.4	75.0	1.2	9.8	......	7,667	13,800	....	
			3	......	49.8	50.2	......	3.9	5.6	78.9	1.2	10.4	......	8,061	14,510	....	
Salt Gum Hollow, Wayne Twp.; Richardson property, Tionesta coal.	....	D	1	8.5	36.4	45.9	9.1	1.3	5.5	65.3	1.1	17.6	4.0	6,511	11,720	2,730	O. 21.
			2	......	39.8	50.2	10.0	1.4	5.0	71.4	1.2	11.0	......	7,117	12,810	....	
			3	......	44.3	55.7	......	1.6	5.5	79.3	1.4	12.2	......	7,911	14,240	....	
Sonora, 1 mile southeast of, Perry Twp.; W. A. Dailey mine, Upper Freeport bed (head of entry).	....	D	1	9.3	38.9	43.6	8.2	3.6	5.6	65.7	1.0	15.9	4.1	6,583	11,850	2,110	O. 21.
			2	......	42.9	48.1	9.0	4.0	5.0	72.4	1.1	8.5	......	7,256	13,060	....	
			3	......	47.1	52.9	......	4.4	5.5	79.6	1.2	9.3	......	7,978	14,360	....	
Washington Twp.; Frank Lucey mine, Middle Kittanning bed.	99	D	1	5.4	39.2	46.1	9.3	3.8	5.3	67.2	1.2	13.2	......	6,822	12,280	....	O. 9.
			2	......	41.4	48.8	9.8	4.0	5.0	71.0	1.3	8.9	......	7,217	12,990	....	
			3	......	45.9	54.1	......	4.4	5.6	78.7	1.4	9.9	......	8,000	14,400	....	
John Lutz mine, Lower Kittanning bed.........	73	D	1	5.1	39.8	47.3	7.8	4.8	5.4	68.1	1.2	12.7	......	6,983	12,570	....	O. 9.
			2	......	41.9	49.9	8.2	5.1	5.1	71.7	1.2	8.7	......	7,356	13,240	....	
			3	......	45.6	54.4	......	5.5	5.5	78.1	1.4	9.5	......	8,011	14,420	....	
Wayne Twp., sec. 4; Frank J. Paul mine, Middle Kittanning bed.	....	D	1	5.9	45.7	42.6	5.8	3.7	5.7	67.2	1.2	16.4	1.9	7,067	12,720	....	O. 21.
			2	......	48.6	45.2	6.2	3.9	5.3	71.5	1.3	11.8	......	7,511	13,520	....	
			3	......	51.8	48.2	......	4.2	5.7	76.2	1.4	12.5	......	8,011	14,420	....	
Zanesville, southeast of, Wayne Twp., sec. 14; Henry Young mine, Lower Kittanning bed.	....	D	1	5.9	41.5	43.9	8.7	4.8	5.4	66.7	1.2	13.2	1.6	6,772	12,190	2,080	O. 21.
			2	......	44.1	46.7	9.2	5.1	5.0	70.8	1.2	8.7	......	7,194	12,950	....	
			3	......	48.6	51.4	......	5.6	5.5	78.0	1.4	9.5	......	7,928	14,270	....	
Zanesville Coal Co. mine, Upper Freeport bed....	150	D	1	5.1	35.5	46.9	12.6	3.8	5.1	64.8	1.3	12.4	......	6,556	11,800	....	O. 9.
			2	......	37.4	49.3	13.3	4.1	4.8	68.3	1.3	8.2	......	6,911	12,440	....	
			3	......	43.1	56.9	......	4.7	5.5	78.8	1.5	9.6	......	7,972	14,350	....	
NOBLE COUNTY.																	
Belle Valley, 1 mile northwest of; Noble mine, No. 7 bed (face of 8 south entry, motor road, 5,700 feet southeast of shaft bottom).	17213	A	1	4.9	37.8	48.9	8.4	3.0	......	......	......	......	1.4	7,072	12,730	2,350	85.
Same (face of 5 room, 7 south entry, 5,600 feet southwest of shaft bottom).	17214	A	1	5.1	37.2	49.6	8.1	3.0	......	......	......	......	1.5	7,056	12,700	2,130	85.
Same (composite of samples 17213 and 17214).....	17215	A	1	5.2	37.3	49.0	8.5	2.9	5.4	70.5	1.5	11.2	1.5	7,072	12,730	....	85.
			2	......	39.4	51.6	9.0	3.1	5.1	74.3	1.6	6.9	......	7,461	13,430	....	
			3	......	43.3	56.7	......	3.4	5.6	81.7	1.7	7.6	......	8,194	14,750	....	
Mount Ephraim Station, 1 mile north of, sec. 33, T. 8 N., R. 8 W.; Wiley Carter mine, Meigs Creek bed, (in room, 300 feet west of mine mouth).	20235	B	1	4.5	39.6	45.6	10.3	4.1	5.3	68.0	1.2	11.1	2.4	6,844	12,320	2,320	123.
			2	......	41.4	47.8	10.8	4.3	5.0	71.2	1.2	7.5	......	7,172	12,910	....	
			3	......	46.5	53.5	......	4.8	5.6	79.6	1.4	8.6	......	8,039	14,470	....	
Quaker City, 3 miles southeast of, sec. 11, T. 8 N., R. 7 W.; G. W. Griffin mine, Meigs Creek bed (350 feet west of mine mouth).	20185	B	1	4.1	38.4	44.9	12.6	3.6	5.2	66.9	1.2	10.6	2.1	6,739	12,130	2,460	123.
			2	......	40.1	46.7	13.2	3.8	5.0	69.8	1.3	7.9	......	7,028	12,650	....	
			3	......	46.2	53.8	......	4.3	5.7	80.3	1.4	8.3	......	8,094	14,570	....	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
NOBLE COUNTY—continued.																	
Steamtown, 1 mile west of, sec. 11, T. 7 N. R. 8 W.; J. T. Moore mine, Meigs Creek bed (480 feet south of mine mouth).	20240	B	1	3.6	41.6	44.3	10.5	4.9	5.3	68.2	1.1	10.0	1.9	6,950	12,510	2,310	123.
			2	......	43.1	46.0	10.9	5.1	5.0	70.7	1.2	7.1	......	7,206	12,970	......	
			3	......	48.4	51.6	......	5.7	5.6	79.3	1.3	8.1	......	8,089	14,560	......	
Elk Twp., NE. ¼; G. W. Love farm, Snaler Run, Meigs Creek bed.	44	D	1	3.1	38.4	46.2	12.3	6.0	5.1	66.2	.9	9.5	......	6,867	12,360	......	O. 9.
			2	......	39.6	47.7	12.7	6.2	4.9	68.3	.9	7.0	......	7,083	12,750	......	
			3	......	45.4	54.6	......	7.1	5.6	78.2	1.0	8.1	......	8,117	14,610	......	
Stock Twp., NW. ¼, sec. 25; Uriah Cleary farm, Meigs Creek coal.	43	D	1	2.6	38.4	47.6	11.4	5.8	5.1	67.5	.9	9.3	......	6,950	12,510	......	O. 9.
			2	......	39.4	48.9	11.7	5.9	5.0	69.3	.9	7.2	......	7,133	12,840	......	
			3	......	44.6	55.3	......	6.7	5.6	78.5	1.1	8.1	......	8,078	14,540	......	
PERRY COUNTY.																	
Bearfield Twp., sec. 3; National Fuel Co. mine No. 34, Middle Kittanning bed.	93	D	1	5.9	36.6	47.4	10.1	5.0	5.3	65.4	1.2	13.0	......	6,689	12,040	......	O. 9.
			2	......	38.9	50.4	10.7	5.3	4.9	69.5	1.3	8.3	......	7,106	12,790	......	
			3	......	43.5	56.5	......	5.9	5.5	77.9	1.5	9.2	......	7,961	14,330	......	
Buckingham Twp., sec. 19; Ohio Central Coal Co. mine No. 19, Nelsonville coal.	48	D	1	6.5	38.9	48.8	5.8	.8	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	41.6	52.2	6.2	.9	......	......	......	......	......	......	......	......	
Clayton Twp., sec. 19; Adam Acher's mine, Lower Kittanning bed.	46	D	1	6.0	42.7	45.5	5.8	1.9	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	45.4	48.5	6.1	2.0	......	......	......	......	......	......	......	......	
Sec. 18; Yosts mine, Middle Kittanning bed.....	95	D	1	6.7	38.3	48.4	6.6	2.4	5.6	68.5	1.3	15.6	......	6,906	12,430	......	O. 9.
			2	......	41.1	51.8	7.1	2.6	5.2	73.4	1.4	10.3	......	7,400	13,320	......	
			3	......	44.2	55.8	......	2.8	5.6	79.0	1.5	11.1	......	7,967	14,340	......	
Dixie; Dixie mine, No. 6 bed (first pair of east entries, 1,000 feet southeast of drift mouth).	2119	A	1	8.9	38.6	46.6	5.9	3.0	......	......	......	......	3.8	6,850	12,330	......	22.
			2	......	42.4	51.2	6.4	3.3	......	......	......	......	......	7,522	13,540	......	
Same (first pair of west entries, 1,000 feet southwest of drift mouth).	2120	A	1	8.9	39.3	47.8	4.0	1.7	......	......	......	......	3.7	......	......	......	22.
			2	......	43.2	52.4	4.4	1.9	......	......	......	......	......	......	......	......	
Harrison Twp., sec. 5; New Crescent mine, Middle Kittanning bed.	97	D	1	5.7	38.9	47.9	8.5	3.4	5.4	67.8	1.2	13.7	......	6,850	12,330	......	O. 9.
			2	......	41.2	49.8	9.0	3.6	5.0	71.9	1.3	9.2	......	7,267	13,080	......	
			3	......	45.2	54.8	......	3.9	5.5	78.9	1.4	10.3	......	7,978	14,360	......	
Sec. 13; Hamilton & Wallace mine, Middle Kittanning bed.	98	D	1	6.4	38.0	48.0	7.6	2.7	5.5	68.1	1.3	14.8	......	6,867	12,360	......	O. 9.
			2	......	40.6	51.3	8.1	2.9	5.1	72.7	1.4	9.8	......	7,339	13,210	......	
			3	......	44.2	55.8	......	3.2	5.6	79.1	1.5	10.6	......	7,983	14,370	......	
Secs. 20 and 29; Keystone No. 1 mine, Middle Kittanning bed.	94	D	1	7.2	37.6	49.9	5.3	2.3	5.6	69.8	1.3	15.7	......	7,006	12,610	......	O. 9.
			2	......	40.5	53.8	5.7	2.5	5.2	75.2	1.4	10.0	......	7,556	13,600	......	
			3	......	43.0	57.0	......	2.7	5.5	79.7	1.4	10.7	......	8,006	14,410	......	

Middletown, Monroe Twp.; Twin mines, Upper Freeport coal.	47	D	1	7.5	38.4	49.5	4.6	1.1	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	41.5	53.6	4.9	1.2	......	......	......	......	......	......	....	....	
Pike Twp., sec. 30; Bristol Coal Co. mine, Middle Kittanning bed.	78	D	1	7.0	37.1	48.9	7.0	2.3	5.6	68.3	1.3	15.5	......	6,878	12,380	....	O. 9.
			2	......	39.9	52.6	7.5	2.5	5.2	73.4	1.4	10.0	......	7,400	13,320	....	
			3	......	43.1	56.9	......	2.7	5.6	79.4	1.5	10.8	......	7,994	14,390	....	
Sec. 2; Coplin's mine, Lower Kittanning bed....	71	D	1	6.9	35.2	47.7	10.2	4.7	5.3	64.8	1.2	13.8	......	6,589	11,860	....	O. 9.
			2	......	37.8	51.3	10.9	5.1	4.8	69.5	1.3	8.4	......	7,078	12,740	....	
			3	......	42.4	57.6	......	5.7	5.4	78.1	1.5	9.3	......	7,944	14,300	....	
Sec. 14; McMonigal's mine, Lower Kittanning bed.	72	D	1	6.7	37.1	49.1	7.1	2.6	5.5	68.3	1.2	15.3	......	6,883	12,390	....	O. 9.
			2	......	39.7	52.7	7.6	2.8	5.1	73.3	1.3	9.9	......	7,383	13,290	....	
			3	......	43.0	57.0	......	3.0	5.5	79.3	1.4	10.8	......	7,994	14,390	....	
Sec. 14; E. E. Tharp's mine, Middle Kittanning bed.	92	D	1	5.3	38.9	45.9	9.9	3.4	5.4	66.1	1.2	14.0	......	6,772	12,190	....	O. 9.
			2	......	41.0	48.6	10.4	3.6	5.1	69.7	1.3	9.9	......	7,150	12,870	....	
			3	......	45.8	54.2	......	4.0	5.7	77.8	1.4	11.1	......	7,978	14,360	....	
Shawnee; Gosline & Barbour mine, No. 6 bed (main entry, 500 feet northeast of drift mouth).	1900	A	1	10.8	34.9	48.2	6.1	1.1	......	......	......	......	6.6	6,661	11,990	....	22.
			2	......	39.1	54.0	6.9	1.2	......	......	......	......	......	7,467	13,440	....	
Same (face of 7 entry, 300 feet northeast of drift mouth).	1901	A	1	9.8	35.7	48.5	6.0	1.4	......	......	......	......	5.2	......	....	....	22.
			2	......	39.6	53.7	6.7	1.6	......	......	......	......	......	......	....	....	
Salt Lick Twp., sec. 21; Upson mine, Middle Kittanning bed.	79	D	1	7.8	33.5	51.2	7.5	1.5	5.5	68.3	1.2	16.3	......	6,772	12,190	....	O. 9.
			2	......	36.3	55.6	8.1	1.6	5.0	74.1	1.3	9.9	......	7,344	13,220	....	
			3	......	39.5	60.5	......	1.7	5.4	80.6	1.4	10.9	......	7,989	14,380	....	
Straitsville, near; Rock Run mine (No. 3)..........	265	D	1	6.2	38.5	48.9	6.4	.7	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	41.1	52.1	6.8	.8	......	......	......	......	......	......	....	....	
Straitsville Central mine, Middle Kittanning bed.	120	D	1	6.7	36.1	50.8	6.4	1.0	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	38.6	54.6	6.8	1.1	......	......	......	......	......	......	....	....	
PORTAGE COUNTY.																	
Diamond; Palmyra Coal Co. mine, Sharon bed (block coal).	201	D	1	4.7	36.7	57.0	1.6	.7	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	38.5	59.8	1.7	.7	......	......	......	......	......	......	....	....	
Scott's mine, Sharon bed (block coal)..........	202	D	1	4.3	37.8	55.0	2.9	.8	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	39.5	57.5	3.0	.8	......	......	......	......	......	......	....	....	
Palmyra; Scott's mine, Sharon bed (cannel bench, bottom portion).	206	D	1	2.6	41.9	42.5	13.0	.9	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	43.0	43.6	13.4	.9	......	......	......	......	......	......	....	....	
SCIOTO COUNTY.																	
Bloom Twp., Eifort Station; Morgan & Horton mine, Clarion bed.	64	D	1	6.8	37.9	46.0	9.3	3.5	5.3	65.3	1.2	15.4	......	6,578	11,840	....	O. 9.
			2	......	40.7	49.3	10.0	3.7	4.9	70.1	1.3	10.0	......	7,056	12,700	....	
			3	......	45.2	54.8	......	4.1	5.5	77.9	1.5	11.0	......	7,844	14,120	....	
Harrison Twp., sec. 36; Steven's cut near Gephart, Anthony coal.	....	D	1	4.4	34.2	55.6	5.8	.6	......	......	......	......	......	......	....	....	O. 20.
			2	......	35.8	58.2	6.0	.7	......	......	......	......	......	......	....	....	
STARK COUNTY.																	
Canton, 5 miles from, Pike Twp.; Evansdale mine, Brookville bed.	93	D	1	2.9	39.0	46.6	11.5	3.1	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	40.1	48.1	11.8	3.2	......	......	......	......	......	......	....	....	
Greentown; Greentown Coal Co. mine, Brookville bed (top bench).	204	D	1	3.7	42.5	48.9	4.9	3.7	......	......	......	......	......	......	....	....	O. Vol. V
			2	......	44.1	50.8	5.1	3.9	......	......	......	......	......	......	....	....	
Nimishillen Twp., sec. 24; McGinty mine, Middle Kittanning bed.	139	D	1	5.7	38.5	45.7	10.1	4.1	5.3	66.9	1.2	12.4	......	6,867	12,360	....	O. 9.
			2	......	40.8	48.5	10.7	4.4	4.9	70.9	1.3	7.8	......	7,278	13,100	....	
			3	......	45.7	54.3	......	4.9	5.5	79.4	1.4	8.8	......	8,150	14,670	....	
North Industry, 2½ miles from, Pike Twp.; Willow Spring mines, Lower Kittanning bed.	94	D	1	4.5	42.4	48.8	4.3	2.6	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	44.4	51.1	4.5	2.7	......	......	......	......	......	......	....	....	

TABLE 2.—*Chemcial analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
STARK COUNTY—continued																	
Osnaburg; Osnaburg Coal Co. mine, Middle Kittanning bed.	59	D	1	4.1	41.1	49.5	5.3	2.7	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.9	51.6	5.5	2.8	......	......	......	......	......	......	......	......	
Sandy Twp.; White Acre Fire-Proofing Co. mine, Middle Kittanning bed.	135	D	1	6.7	36.2	48.9	8.2	2.7	5.4	68.9	1.2	13.6	......	6,978	12,560	......	O. 9.
			2	......	38.8	52.4	8.8	2.9	5.0	73.9	1.3	8.1	......	7,472	13,450	......	
			3	......	42.6	57.4	......	3.1	5.4	81.0	1.4	9.1	......	8,194	14,750	......	
SUMMIT COUNTY.																	
Coventry Twp.; Lakeview mine, Quakertown bed...	70	D	1	5.2	40.7	51.9	2.2	.8	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	42.9	54.8	2.3	.8	......	......	......	......	......	......	......	......	
Norton Twp.; Burnet mine, Sharon bed............	69	D	1	5.6	38.3	49.7	6.4	1.0	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	40.6	52.7	6.7	1.1	......	......	......	......	......	......	......	......	
TRUMBULL COUNTY.																	
Brookfield Twp.; Chew coal bank, Sharon bed (block coal).	9	D	1	4.4	36.2	49.7	9.7	3.1	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	37.8	52.1	10.1	3.2	......	......	......	......	......	......	......	......	
Cleveland shaft, Otis Coal Co. mine, Sharon bed (block coal).	10	D	1	4.6	38.4	50.4	6.6	2.0	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	40.2	52.9	6.9	2.1	......	......	......	......	......	......	......	......	
Liberty Twp.; Highton shaft No. 1, Sharon bed (block coal).	6	D	1	4.7	35.8	52.6	6.9	1.0	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	37.6	55.2	7.2	1.1	......	......	......	......	......	......	......	......	
Church Hill Coal Co., No. 2 mine, Sharon bed (block coal).	....	D	1	5.9	35.0	55.7	3.4	.8	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	37.2	59.2	3.6	.8	......	......	......	......	......	......	......	......	
Same (cannel coal which sometimes comes in the middle of block coal).	....	D	1	2.4	49.3	38.0	10.3	.8	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	50.5	38.9	10.6	.9	......	......	......	......	......	......	......	......	
TUSCARAWAS COUNTY.																	
Auburn Twp., sec. 17; Jacob Groh mine, Middle Kittanning bed.	128	D	1	4.3	40.1	48.0	7.6	4.0	5.4	69.4	1.3	12.3	......	7,000	12,600	......	O. 9
			2	......	41.9	50.1	8.0	4.2	5.2	72.5	1.3	8.8	......	7,317	13,170	......	
			3	......	45.5	54.5	......	4.5	5.6	78.8	1.5	9.6	......	7,950	14,310	......	
Bucks Twp.; Troyer Co. mine, Middle Kittanning bed.	116	D	1	5.2	40.8	48.1	5.9	3.6	5.6	70.1	1.4	13.4	......	7,122	12,820	......	O. 9.
			2	......	43.0	50.8	6.2	3.7	5.3	74.0	1.4	9.4	......	7,511	13,520	......	
			3	......	45.9	54.1	......	4.0	5.6	78.8	1.5	10.1	......	8,006	14,410	......	

Original from UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Dover Twp.; Timothy Sewell mine, Middle Kittanning bed.	121	D	1	3.5	40.3	50.2	6.0	3.2	5.4	72.1	1.3	12.0	......	7,294	13,130	......	O. 9.
			2	......	41.7	52.1	6.2	3.3	5.2	74.8	1.3	9.2	......	7,561	13,610	......	
			3	......	44.5	55.5	......	3.5	5.6	79.7	1.4	9.8	......	8,067	14,520	......	
Joseph Shilling mine, Middle Kittanning bed....	122	D	1	4.9	36.2	49.4	9.5	4.2	5.1	67.5	1.3	12.4	......	6,856	12,340	......	O. 9.
			2	......	38.1	51.9	10.0	4.4	4.8	71.1	1.4	8.3	......	7,211	12,980	......	
			3	......	42.3	57.7	......	4.9	5.4	78.9	1.5	9.3	......	8,011	14,420	......	
Gnadenhutten, Clay Twp.; Solomon Stocher mine, Middle Kittanning bed.	131	D	1	3.4	39.7	47.5	9.4	4.9	5.2	68.8	1.3	10.4	......	6,972	12,550	......	O. 9.
			2	......	41.1	49.2	9.7	5.1	5.0	71.2	1.3	7.7	......	7,217	12,990	......	
			3	......	45.6	54.4	......	5.6	5.6	78.9	1.5	8.4	......	7,994	14,390	......	
Goshen Twp., sec. 12 E.; Goshen Coal Co. mine, Middle Kittanning bed.	123	D	1	3.5	41.6	47.2	7.7	4.6	5.5	70.3	1.2	10.7	......	7,156	12,880	......	O. 9.
			2	......	43.1	48.9	8.0	4.7	5.2	72.8	1.3	8.0	......	7,411	13,340	......	
			3	......	46.8	53.2	......	5.1	5.7	79.1	1.4	8.7	......	8,056	14,500	......	
Mill Twp.; Cyrus Kilpatrick mine, Middle Kittanning bed.	130	D	1	3.8	38.3	49.5	8.4	3.8	5.3	70.3	1.2	11.0	......	7,100	12,780	......	O. 9.
			2	......	39.8	51.4	8.8	4.0	5.0	73.1	1.3	7.8	......	7,378	13,280	......	
			3	......	43.6	56.4	......	4.4	5.5	80.1	1.4	8.6	......	8,089	14,560	......	
Mineral Point, Sandy Twp.; C. E. Holden's new mine, Lower Kittanning bed.	51	D	1	4.3	41.6	48.0	6.1	3.3	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	43.5	50.1	6.4	2.4	......	......	......	......	......	......	......	......	
Mineral City, ¼ mile south of; Huff mine, No. 5 bed (7,000 feet southeast of mine mouth).	3968	A	1	5.6	36.3	49.4	8.7	2.9	......	......	......	......	1.3	......	......	......	22.
			2	......	38.4	52.4	9.2	3.1	......	......	......	......	......	......	......	......	
Same (6,600 feet southeast of opening)............	3969	A	1	4.5	39.9	47.1	8.5	3.7	......	......	......	......	1.1	7,139	12,850	......	22.
			2	......	41.8	49.3	8.9	3.9	......	......	......	......	......	7,467	13,440	......	
Same (fresh face)..................................	77	D	1	5.3	38.7	48.3	7.7	3.3	5.5	69.8	1.2	12.5	......	7,167	12,900	......	O. 9.
			2	......	40.9	51.0	8.1	3.4	5.1	73.7	1.3	8.4	......	7,572	13,630	......	
			3	......	44.5	55.5	......	3.7	5.6	80.2	1.4	9.1	......	8,239	14,830	......	
Newcomerstown, Salem Twp.; Jacob Stonebrook mine, Middle Kittanning bed.	133	D	1	3.5	40.0	48.8	7.7	5.2	5.3	70.0	1.3	10.5	......	7,133	12,840	......	O. 9.
			2	......	41.5	50.6	7.9	5.4	5.1	72.5	1.3	7.8	......	7,389	13,300	......	
			3	......	45.0	55.0	......	5.9	5.5	78.8	1.4	8.4	......	8,028	14,450	......	
Newport, Roush Twp.; Houck's farm, Upper Kittanning bed.	....	D	1	3.2	30.8	59.8	6.2	3.1	......	......	......	......	......	......	......	......	O. Vol. III.
			2	......	31.8	61.8	6.4	3.2	......	......	......	......	......	......	......	......	
Sandy Twp., near center of; Tuscarawas Coal & Iron Co. mine, Middle Kittanning bed.	126	D	1	4.9	38.1	49.9	7.0	2.9	5.4	70.5	1.3	12.9	......	7,083	12,750	......	O. 9.
			2	......	40.1	52.5	7.4	3.1	5.1	74.1	1.4	8.9	......	7,450	13,410	......	
			3	......	43.3	56.7	......	3.3	5.5	80.0	1.5	9.7	......	8,044	14,480	......	
Tunnel Hill mine, Lower Kittanning bed........	50	D	1	3.4	42.1	43.7	10.8	4.8	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	43.6	45.2	11.2	4.9	......	......	......	......	......	......	......	......	
Pike Run, Goshen Twp.; Brockhill mine, Middle Kittanning bed.	66	D	1	2.7	44.7	47.0	5.6	3.1	......	......	......	......	......	......	......	......	O. Vol. V.
			2	......	46.0	48.2	5.8	3.2	......	......	......	......	......	......	......	......	
Somerdale, Fairfield Twp.; Somerdale Coal Co. mine, Middle Kittanning bed.	138	D	1	7.2	38.3	49.9	4.6	2.6	5.6	71.3	1.2	14.7	......	7,194	12,950	......	O. 9.
			2	......	41.3	53.8	4.9	2.8	5.2	76.8	1.3	9.0	......	7,750	13,950	......	
			3	......	43.4	56.6	......	3.0	5.5	80.7	1.4	9.4	......	8,150	14,670	......	
Warwick Twp.; Medville & Goshen Coal Co. mine, Middle Kittanning bed.	124	D	1	4.1	41.6	49.1	5.2	3.3	5.6	72.5	1.4	12.0	......	7,333	13,200	......	O. 9.
			2	......	43.4	51.2	5.4	3.4	5.3	75.6	1.5	8.8	......	7,644	13,760	......	
			3	......	45.9	54.1	......	3.6	5.6	79.9	1.6	9.3	......	8,083	14,550	......	
York Twp.; West Goshen mine, Middle Kittanning bed.	134	D	1	3.2	43.6	46.3	6.9	4.1	5.5	71.1	1.3	11.1	......	7,306	13,150	......	O. 9.
			2	......	45.0	47.8	7.2	4.3	5.3	73.5	1.3	8.4	......	7,544	13,580	......	
			3	......	48.5	51.5	......	4.6	5.7	79.1	1.4	9.2	......	8,128	14,630	......	
VINTON COUNTY.																	
Clarion; Clarion mine, No. 4 bed (face of 6 room, east entry, 4,900 feet northeast of drift mouth).	2208	A	1	6.8	40.0	45.5	7.7	3.3	......	......	......	......	2.8	6,950	12,510	......	22.
			2	......	42.9	48.9	8.2	3.6	......	......	......	......	......	7,456	13,420	......	
Same (face of 5 butt entry, main entry, 800 feet west of drift mouth).	2209	A	1	7.4	41.6	44.8	6.2	2.8	......	......	......	......	3.4	......	......	......	22.
			2	......	44.9	48.4	6.7	3.0	......	......	......	......	......	......	......	......	
Elk Twp., sec. 27; J. T. Dickson mine, Clarion bed...	69	D	1	5.0	39.2	46.5	9.3	3.5	5.4	67.2	1.3	13.3	......	6,917	12,450	......	O. 9.
			2	......	41.2	49.0	9.8	3.7	5.1	70.7	1.4	9.3	......	7,272	13,090	......	
			3	......	45.7	54.3	......	4.1	5.7	78.4	1.5	10.3	......	8,067	14,520	......	

TABLE 2.—*Chemical analyses of mine samples*—Continued.

Locality, mine, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temperature (° F.).	Reference.
	Laboratory No.	Kind.	Condition.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	B. t. u.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
VINTON COUNTY—continued.																	
Minerton; Lawler mine, Clarion bed................	61	D	1	4.5	40.1	46.5	8.9	4.2	5.4	67.2	1.3	13.0	......	6,906	12,430	....	O. 9.
			2	......	42.0	48.7	9.3	4.4	5.2	70.4	1.3	9.4	......	7,233	13,020	....	
			3	......	46.3	53.7	......	4.9	5.7	77.5	1.5	10.4	......	7,972	14,350	....	
Swan Twp., sec. 3; George Cherry coal bank, Middle Kittanning bed (60 feet from outcrop).	82	D	1	4.9	39.2	45.7	10.2	4.3	5.4	66.3	1.2	12.6	......	6,844	12,320	....	O. 9.
			2	......	41.2	48.1	10.7	4.5	5.1	69.7	1.3	8.7	......	7,200	12,960	....	
			3	......	46.1	53.9	......	5.0	5.7	78.0	1.4	9.9	......	8,056	14,500	....	
Vinton Twp., sec. 34; Hanging Rock mine, Clarion bed (face of 2 rooms).	54	D	1	5.0	40.3	46.5	8.2	2.9	5.5	68.5	1.3	13.6	......	6,961	12,530	....	O. 9.
			2	......	42.4	49.0	8.6	3.0	5.2	72.1	1.4	9.7	......	7,328	13,190	....	
			3	......	46.4	53.6	......	3.3	5.7	78.9	1.5	10.6	......	8,017	14,430	....	
Sec. 33; Vinton Coal Co. mine, Clarion bed.......	58	D	1	4.6	41.4	42.9	11.1	5.3	5.4	64.9	1.3	12.0	......	6,761	12,170	....	O. 9.
			2	......	43.4	45.0	11.6	5.5	5.1	68.1	1.4	8.3	......	7,089	12,760	....	
			3	......	49.1	50.9	......	6.3	5.8	77.0	1.5	9.4	......	8,022	14,440	....	
WASHINGTON COUNTY.																	
Adams Twp., ½ mile from coal run; Felix mine, Meigs Creek bed.	53	D	1	3.0	37.5	46.6	12.9	5.6	5.1	65.9	.9	9.6	......	6,800	12,240	....	O. 9.
			2	......	38.6	48.1	13.3	5.7	4.9	67.9	1.0	7.2	......	7,006	12,610	....	
			3	......	44.5	55.5	......	6.6	5.6	78.3	1.1	8.4	......	8,078	14,540	....	
Aurelius Twp., sec. 28, 1½ miles west of Elba; Charles Schimmel land, Meigs Creek bed.	52	D	1	3.4	38.0	49.0	9.6	5.0	5.3	68.3	.9	10.9	......	7,083	12,750	....	O. 9.
			2	......	39.3	50.8	9.9	5.2	5.1	70.7	.9	8.2	......	7,333	13,200	....	
			3	......	43.6	56.4	......	5.8	5.7	78.5	1.0	9.0	......	8,139	14,650	....	
WAYNE COUNTY.																	
Baughman Twp.; Fox Lake mine, Sharon bed......	95	D	1	5.9	37.7	53.8	2.6	.7	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	40.1	57.1	3.8	.7	......	......	......	......	......	......	....	....	
Chippewa Twp.; New Chippewa mine, Sharon bed..	97	D	1	5.4	38.4	51.2	5.0	1.8	......	......	......	......	......	......	....	....	O. Vol. V.
			2	......	40.6	54.2	5.2	1.9	......	......	......	......	......	......	....	....	

DESCRIPTION OF SAMPLES FROM LAUGHLIN MINE, BELMONT COUNTY.

Below is a description of samples from the Laughlin mine, Belmont County. These samples were analyzed by the Bureau of Mines, but the description has not appeared in any of its publications:

Analyses 34002–5. Bituminous coal from Laughlin mine, a drift mine at Martins Ferry on the Baltimore & Ohio and Pennsylvania Railroads. Coal bed, Pittsburgh; Carboniferous age, Monongahela formation. Observed thickness of bed, 6 feet ½ inch to 6 feet 3 inches. Roof, roof coal; floor, coal and limestone. The bed was measured and sampled at three points on February 5, 1920, by P. D. Browning, as shown below:

Sections of coal bed in Laughlin mine.

Section	A	B	C
Laboratory No.	34002	34003	34004
	Ft. in.	*Ft. in.*	*Ft. in.*
Draw slate	[a] 0 9	[a] 1 0	[a] 1 3
Coal	2 6	2 5	2 2½
Bone	0 0¼	0 0⅛	....
Shale	....	....	[a] 0 1
Coal	0 2½	0 2	0 2½
Shale	0 0¼	[a] 0 1	[a] 0 0¾
Coal	0 6	0 5½	0 9½
Shale	[a] 0 0½	....	....
Mother coal	....	0 0¼	0 0¼
Coal	2 0	0 9½	1 7½
Mother coal	....	0 0¼	....
Coal	....	1 2	....
Thickness of bed	6 0½	6 1⅝	6 3
Thickness of coal sampled	5 2¾	5 0⅝	4 10¼

[a] Not included in sample.

Section A (sample 34002) was measured at right rib, 50 feet from face of main haulage entry. Section B (sample 34003) was measured at last crosscut, 17 and 18 right butts, 23 south entry. Section C (sample 34004) was measured at left rib, 50 feet from face of 23 south entry.

The ultimate analysis of a composite sample made by combining face samples 34002–4 is given in Table 2 under laboratory No. 34005.

At the time of sampling the daily output was 350 tons; 85 men were employed underground, 12 above. Tipples of both wood and steel.

System of mining, room and pillar; black powder used as explosive. Coal, shipped as run of mine, derived chiefly from advance workings. In 1920 the lifetime of the mine was estimated to be 20 to 25 years.

TABLE 3.—*Analyses of peat.*

Location.	Laboratory No.	Kind.	Moisture in air-dried sample.	Moisture-free basis.						
				Volatile matter[a]	Fixed carbon.	Ash.	Sulphur.	Nitrogen.	Calories.	B. t. u.
1	2	3	4	5	6	7	8	9	10	11
Ashland County. Lakeville, 1½ miles northeast of, Lake Twp.; sec. 30, cranberry marsh	11122	D	7.1	67.4	24.9	7.7	.3	2.4	5,039	9,070
Ashtabula County. Orrville, 4 miles southeast of, Orrwell Twp.; tamarack swamp	10773	D	9.1	63.2	26.2	10.6	.5	2.5	4,983	8,970
Champaign County. Urbana, 6 miles southeast of, Urbana Twp.; secs. 31–32, cedar swamp	11008	D	10.7	57.0	26.4	16.6	1.2	2.6	4,206	7,570
Crawford County. New Washington, 2 miles south of, Cranberry Twp.; secs. 24–26, cranberry marsh	12477	D	13.5	62.5	27.1	10.4	.5	3.2	4,822	8,680
Cuyahoga County. Granga Lake Station, ½ mile west of, Solon Twp.; T. 6 N. R. 10 W	10778	D	9.0	51.1	23.5	25.4	.8	2.1	4,167	7,500
Darke County. New Madison, ½ mile south of, Harrison Twp.; sec. 13, Mud Creek bog	12475	D	16.2	54.8	19.5	25.7	.6	3.1	3,778	6,800
½ mile east of, Butler Twp.; secs. 7–18, Mud Creek bog	12476	D	12.7	43.4	11.5	45.1	.4	2.3	2,578	4,640
Defiance County. Clarksville, 1½ miles southeast of, Milford Twp.; secs. 2–11, tamarack swamp	11348	D	8.6	62.4	25.3	12.3	.5	2.6	4,678	8,420
Same, cranberry swamp	11349	D	9.0	60.5	28.0	11.5	.4	2.9	4,761	8,570
Fairfield County. Amanda, 1½ miles north of, Amanda Twp.; sec. 36	11115	D	7.6	57.7	21.0	21.3	4.2	3.3	4,222	7,600
Geauga County. Burton, 3 miles southwest of, Burton Twp.; T. 7 N. R. 7 W., Kellmare Lake	10798	D	10.1	60.1	27.9	12.0	.3	2.2	4,856	8,740
Green County. Dayton, 6 miles northeast of, Bath Twp.; secs. 1–2, Simm's bog	12473	D	15.6	58.7	24.2	17.1	1.9	3.6	4,583	8,250
Hardin County. McGuffey, 2½ miles south of, Marion Twp.; sec. 27, Scioto marsh	11010	D	10.9	58.9	26.9	14.2	1.2	3.4	4,400	7,920
Same	11012	D	10.8	60.7	27.5	11.8	1.0	3.4	4,444	8,000
Holmes County. Lakeville, 1¼ miles northwest of, Washington Twp.: sec. 26, cranberry marsh	11121	D	7.0	69.5	24.7	5.8	.2	2.4	5,317	9,570
Huron County. Chicago Junction, 4½ miles southwest of, Richmond Twp.; New Haven marsh	10733	D	8.8	59.7	29.4	10.9	1.0	2.8	4,950	8,910
Plymouth, 5½ miles west of, Richmond Twp.; New Haven marsh	11014	D	9.2	54.9	25.6	19.5	.9	2.7	4,139	7,450
Licking County. Buckeye Lake, ½ mile southeast of, Licking Twp.; cranberry marsh	10772	D	9.9	61.6	27.1	11.3	.6	2.2	4,511	8,120
Buckeye Lake, 1½ miles northeast of, Union Twp.; sec. 13, cranberry marsh	10709	D	7.9	74.8	21.3	3.9	.3	2.5	4,633	8,340
Same	10710	D	9.2	67.1	24.4	8.5	.4	1.0	4,794	8,630
Mahoning County. Snyder, 1½ miles east of, Beaver Twp.; secs. 24–36, Snyder's bog	10797	D	10.0	62.0	29.0	9.0	.3	2.7	4,856	8,740
Medina County. Lode, 2 miles southeast of, Harrisville Twp.; garden hole	11119	D	7.5	55.6	26.7	17.7	.7	2.6	4,539	8,170
Same, Westfield Twp.; gardenhole	11120	D	7.7	56.9	21.0	22.1	4.6	2.6	3,961	7,130
Mercer County. Burkellsville, 2½ miles north of, Grandville Twp.; secs. 26–35, cranberry prairie	11347	D	8.7	64.5	28.1	7.4	.5	2.8	4,956	8,920
Cranberry prairie, 2 miles west of, secs. 26–35, cranberry prairie	11321	D	9.3	55.8	25.8	18.4	1.4	3.2	4,322	7,780
Same, sec. 35	11320	D	10.2	55.7	24.5	19.8	1.1	3.0	4,311	7,760
Montgomery County. Germantown, 1 mile east of, German Twp.; sec. 18, fossil bog	12472	D	7.0	26.8	6.2	67.0	.6	.9	1,617	2,910
Portage County. Atwater Center, ½ mile north of, Atwater Twp.; Atwater bog	10814	D	8.7	68.0	25.9	6.1	.3	3.0	5,244	9,440
Brinfield, ½ mile southeast of, Brinfield Twp.; sec. 20, Brinfield bog	10806	D	11.3	57.6	31.2	11.2	.7	2.3	4,756	8,560
Same, ½ mile east of, cranberry marsh	10805	D	8.4	57.6	27.6	14.8	.3	1.6	5,000	9,000
Kent, 5 miles northeast of, Franklin Twp.; Eckert bog	10815	D	9.4	66.7	29.6	3.7	.2	1.7	5,411	9,740
Mantua, ½ mile north of, Mantua Twp.; tamarack swamp	10777	D	10.4	56.3	26.2	17.5	.9	2.5	4,550	8,190
Nelson Twp.; 3 miles east of, Garrettsville; Nelson marsh	11007	D	9.1	40.4	18.1	41.5	.4	1.7	2,844	5,120
Ravenna Twp., south of city limits; Ravenna bog	10813	D	9.0	56.5	25.9	17.6	.4	2.2	4,667	8,400
Seneca County. Carey, 3 miles north of, Big Spring Twp.; sec. 32, Big Spring prairie	10687	D	11.0	56.7	23.6	19.7	1.7	3.5	4,306	7,750
Shelby County. Kettlersville, 1¼ miles south of, Van Buren Twp.; sec. 14	12474	D	16.3	57.2	24.5	18.3	.6	2.7	4,267	7,680

Stark County. Canton, 7 miles west of, Canton Twp.; secs. 6-7, celery swamp	11147	D	10.4	57.3	33.4	9.3	.4	2.9	4,328	7,790
1¼ miles west of, sec. 6; celery swamp	11148	D	8.8	53.8	33.6	12.6	.4	2.8	4,722	8,500
Same, tamarack swamp	11149	D	8.0	62.0	31.9	6.1	.3	3.4	4,911	8,840
Summit County. Akron, 2 miles west of, Portage Twp.; Copley tamarack bog	10830	D	10.5	60.7	28.9	10.4	.8	2.9	4,833	8,700
Hudson, 2 miles southwest of, Hudson Twp.; mud lake	10829	D	8.9	59.3	26.4	14.3	1.0	2.3	4,650	8,370
Sherbondig, 2 miles west of, Copley Twp.; Copley bog	10832	D	11.4	56.9	31.8	11.3	.9	2.7	4,922	8,860
Trumbull County. Lockwood, ½ mile east of, Greene Twp.; tamarack swamp	10774	D	8.4	59.6	22.7	17.7	.4	2.7	4,528	8,150
Wayne County. Orville, 1½ miles east of, Baughman Twp.; secs. 20-21; onion farm	11116	D	7.0	61.8	27.2	11.0	.8	3.0	4,783	8,610
Same	11117	D	7.4	63.3	32.1	4.6	.3	2.2	5,317	9,570
Same	11118	D	7.6	57.7	26.1	16.2	.4	2.6	4,600	8,280
Warrick, 3 miles west of, Baughman Twp., secs. 1-12; Fox Lake bog	11318	D	7.3	66.4	29.7	3.9	.2	2.3	5,083	9,150
Same, 3 miles south of	11319	D	7.0	54.5	25.0	20.5	.9	2.4	4,378	7,880
Williams County. Eden, 3 miles southwest of, Florence Twp.; sec. 30; tamarack bog	13180	D	10.1	63.6	23.3	13.1	.3	2.6	4,639	8,350
Same	13181	D	10.4	59.9	28.0	12.1	.3	2.9	4,739	8,530
Montpelier, 1 mile southeast of, Superior Twp.; Underwood-Chapman bog	13182	D	8.4	70.0	20.3	9.7	.2	3.4	4,950	8,910
Pioneer, 4½ miles west of, Bridgewater Twp.; sec. 14-15; tamarack bog	11046	D	9.1	62.2	30.2	7.6	.2	2.0	5,217	9,390
2¼ miles southwest of, Madison Twp.; sec. 16; tamarack bog	11047	D	12.0	64.4	16.6	19.0	.5	2.4	4,950	8,910
Wyandot County. Carey, 1½ miles north of, Crawford Twp., sec. 8; Big Spring prairie	10684	D	10.6	57.3	28.1	14.6	1.1	3.0	4,656	8,380
Same	10685	D	10.4	57.0	29.4	13.6	1.4	2.8	4,711	8,480
Same, sec. 5	10686	D	9.9	57.2	21.9	20.9	2.0	2.9	4,267	7,680
Upper Sandusky, 1½ miles north of, Crane Twp., sec. 8; cranberry marsh	10688	D	8.8	51.9	25.1	23.0	2.2	2.2	4,261	7,670

---

[a] The volatile matter in all samples of peat was determined by the modified method.

NOTE.—These samples of peat were collected by the Ohio Geological Survey, but were analyzed by the Bureau of Mines Laboratory at Pittsburgh. The analyses were published in Ohio Geological Survey Bull. 16, ser. 4, 1912. The samples were partly air-dried before analysis and the moisture content in the table is the moisture in the air-dried sample. The remainder of the analyses figures are given on the moisture-free basis.

ANALYSES OF DELIVERED COAL.

By N. H. SNYDER.[8]

INTRODUCTION.

Coal analyses help to describe the character of coal as it lies in the ground or as it may be delivered to the user. There is a distinct difference between "mine samples" and "delivered samples." Analyses of mine samples of coal are plentiful, but available analyses of delivered coal are relatively few. Mine samples are collected according to a standard method.[9] The sampler cuts a channel 2 by 6 inches or 3 by 4 inches from roof to floor in the face of the seam and excludes from the sample any partings more than three-eighths of an inch thick and any lenses or concretions of "sulphur," or other impurities, more than 2 inches in maximum diameter and one-half of an inch thick.

Analyses of mine samples form a permanent or scientific record of the coal bed at the point sampled; they are important in determining the character of the coal in any given mine or district. These analyses, when the samples are taken in a standardized manner, are valuable to the operator. When compared with analyses of delivered coal they show him whether or not his mine is being efficiently worked or whether the coal is being properly prepared—which involves the question whether he has suitable mechanical appliances for separating the impurities.

In the purchase of coal, mine samples may serve as a sufficient guide to the experienced purchaser who has knowledge of the impurities in the seam and the degree to which these are eliminated in mining and preparing the coal. To the average purchaser, however, unacquainted with these details, dependence on mine samples may be misleading. The quality of coal indicated by the face samples can rarely if ever be attained in the delivered coal. Certain impurities that are eliminated from the formally prepared mine sample may not be eliminated by the miner interested in getting out a large tonnage. Some of the roof and floor may also be included if these are soft or flaky. Some mine analyses, particularly those taken from geological reports, may be either from outcrop coal or small workings not beyond the influence of weathering. When coal prices are high and competition is lessened it is easy for the miner and the management to lower the standards of preparation of the coal, and a return to rigid standards is always difficult.

---

[8] Engineer in charge of fuel inspection, Bureau of Mines.

[9] Holmes, J. A. The sampling of coal in the mine: Tech. Paper 1, Bureau of Mines, 1918, 17 pp.

In sampling delivered coal the Bureau of Mines follow a definite procedure.[10] A sample of not less than 1,000 pounds is systematically collected by taking equal increments at regular intervals throughout the delivery, while coal is being loaded or unloaded, and by crushing and reducing this sample by successive stages to laboratory size.

In using analyses of samples of delivered coal, one must recognize that coal is not always of uniform size and that the impurities are not uniformly distributed throughout the mass. Hence there will be some variation in the results of sampling, and even though the same mass of coal is sampled a number of times, the analyses would not agree absolutely except by chance. It is only when a considerable number of analyses representing a considerable tonnage mined over a period of time are available that the average value and range of variation of a particular coal become known with certainty. With reasonable tolerances, however, for these variations, delivered coal can be sampled accurately enough for all practical purposes.

Delivered coal from any given mine may differ from day to day through variations in mining or preparing the coal; hence a record of analysis of delivered coal for any one time should not be considered as a permanent record, for the output may be greatly improved by new methods of mining and preparation; or, on the other hand, the output may deteriorate through carelessness in mining or preparation.

Table 4 gives the analyses of samples collected by representatives of the various Government departments, under direction of the Bureau of Mines, from coal delivered to the Government under contract. Samples were collected systematically throughout the entire delivery of coal. These records of delivered coal indicate more nearly what the consumer is likely to receive, but the amount of coal represented and the number of analyses made must be carefully considered.

---

[10] Pope, G. S., Methods of sampling delivered coal and specifications for the purchase of coal for the Government: Bull. 116, Bureau of Mines, 1918, 64 pp. Pope, G. S., Directions for sampling coal for shipment or delivery: Tech. Paper 133, Bureau of Mines, 1917, 5 pp.

TABLE 4.—*Analyses of*

Where mined.			Commercial name of coal.	Size of coal.	Approximate tons delivered.
County and town.	Mine.	Bed.			
1	2	3	4	5	6
Athens County:					
Hocking	Eclipse	Hocking or No. 6.	Eclipse	Lump	196
Do	do	do	do	do	200
Do	do	do	do	do	248
Belmont County:					
Bellaire	Empire No. 1	Pittsburgh or No. 8.		Run of mine	
Do	do	do		do	
Flushing	Black Oak	do		Lump over ¼-inch screen.	
Neffs	Neff No. 1	do		Run of mine	
Guernsey County:					
Danforth	Forsythe	No. 7		Lump over 1¼-inch bar screen.	
Harrison County:					
Blairmont	Majestic	Pittsburgh or No. 8.	Pittsburgh or No. 8.	Lump over ¾-inch screen.	999
Hocking County:					
Coalgate	Coalgate	No. 6	Hocking Valley.	Lump over 3-inch screen.	960
Do	do	do	do	Lump over 2-inch screen.	3,775
Longstreth	Stalter No. 1	do	do	Lump	3,424
Do	do	do	do	do	3,185
Do	do	do	do	do	3,305
Jackson County:					
Wellston	No. 10	No. 4		Run of mine	
Do	do	No. 5		do	
			Milton Jackson.	Lump	395
Jefferson County:					
Bradley	Crow Hollow	Pittsburgh or No. 8.		Lump over ¾-inch bar screen.	
Rush Run	Beech Flats	do	Beech Flats	Nut, pea, and slack through 2-inch screen.	7,428
Do	Rush Run No. 1	do		Lump over ¾-inch bar screen.	
Perry County:					
Dixie	Dixie	No. 6		Run of mine	
New Straightsville.		do	Big Vein Hocking.	do	4,500
Shawnee	Gosline and Barbour.	do		do	
Tuscarawas County:					
Mineral City	Huff	No. 5		Lump over 1¼-inch bar screen.	
Vinton County:					
Clarion	Clarion	No. 4		Lump over 1¼-inch screen.	
Do	do	do		Nut and slack through 1¼-inch screen.	

Original from UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

delivered coal.

Proximate analysis.					Calorific value, per pound.						Number of analyses averaged.	Place of delivery.	Dates of delivery.
As received.	Moisture-free coal.				As received.		Moisture-free.		Moisture-free and ash-free.				
Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	B. t. u.	Calories.	B. t. u.	Calroies.	B. t. u.	Calories.			
7	8	9	10	11	12	13	14	15	16	17	18	19	20
2.6	36.5	55.9	7.6	1.2	13,620	7,567	13,980	7,767	15,130	8,406	20	National Home for Disabled Volunteer Soldiers, Northwestern Branch, Wis.	1911–12
2.3	36.9	54.1	9.0	1.2	13,440	7,467	13,760	7,644	15,120	8,400	19	.....do.....................	1912–13
2.2	39.7	52.2	8.1	1.7	13,570	7,539	13,880	7,711	15,100	8,389	13	.....do.....................	1913–14
4.1	41.0	49.2	9.8	4.1	12,880	7,156	13,430	7,461	14,890	8,272	1	St. Louis testing plant......	1906
3.0	38.8	50.9	10.3	3.8	12,930	7,183	13,330	7,406	14,860	8,256	1	.....do.....................	1906
3.4	37.3	49.3	13.4	4.5	12,290	6,828	12,720	7,067	14,690	8,161	1	.....do.....................	1906
5.3	38.8	52.2	9.0	3.5	12,840	7,133	13,560	7,533	14,900	8,278	1	.....do.....................	1905
6.7	36.4	52.3	11.3	3.4	12,180	6,767	13,050	7,250	14,710	8,172	1	.....do.....................	1905
2.6	43.4	49.4	7.2	3.6	13,270	7,372	13,620	7,567	14,680	8,156	1	Post office building, Toledo, Ohio.	1913–14
7.7	40.0	54.1	5.9	2.0	12,500	6,944	13,540	7,522	14,390	7,994	6	Columbus Barracks, Ohio...	1919–20
7.4	39.1	51.9	9.0	1.8	12,050	6,694	13,010	7,228	14,300	7,944	16	.....do.....................	1920–21
6.3	39.7	52.7	7.6	1.9	12,600	7,000	13,450	7,472	14,560	8,089	30	.....do.....................	1911–12
6.6	40.9	51.5	7.6	2.0	12,550	6,972	13,440	7,467	14,550	8,083	21	.....do.....................	1912–13
6.3	41.1	48.3	10.6	3.4	12,120	6,733	12,940	7,189	14,470	8,039	21	.....do.....................	1913–14
7.7	41.5	45.5	13.0	5.0	11,520	6,400	12,480	6,933	14,340	7,967	1	St. Louis testing plant......	1905
9.0	39.4	48.1	12.5	4.4	11,490	6,383	12,630	7,017	14,430	8,017	1	.....do.....................	1905
9.3	....	....	9.6	....	11,790	6,550	13,000	7,222	14,380	7,989	8	Courthouse and post office, Toledo, Ohio.	1907–08
3.5	38.8	51.7	9.5	3.6	13,080	7,267	13,550	7,528	14,970	8,317	1	St. Louis testing plant......	1905
4.3	38.0	50.5	11.5	3.5	12,430	6,906	12,990	7,217	14,680	8,156	16	Marion Branch, National Home for Disabled Volunteer Soldiers, Marion, Ind.	1919–20
4.3	37.1	55.3	7.6	1.8	13,190	7,328	13,780	7,656	14,910	8,283	1	St. Louis testing plant......	1905
7.6	41.1	49.8	9.1	3.1	12,120	6,733	13,120	7,289	14,430	8,017	1	.....do.....................	1905
8.0	39.1	53.5	7.4	1.6	12,130	6,739	13,190	7,328	14,240	7,911	16	Columbus Barracks, Ohio...	1921–22
9.9	37.4	49.7	12.9	2.0	11,280	6,267	12,520	6,956	14,370	7,983	1	St. Louis testing plant......	1905
4.5	42.5	49.6	7.9	3.1	12,960	7,200	13,570	7,539	14,730	8,183	1	.....do.....................	1906
5.6	39.0	52.2	8.8	3.3	12,770	7,094	13,530	7,517	14,840	8,244	1	.....do.....................	1905
8.1	40.1	46.9	13.0	3.7	11,560	6,422	12,580	6,989	14,460	8,033	1	.....do.....................	1905

BIBLIOGRAPHY.

The following publications contain analyses of Ohio coals.

OHIO GEOLOGICAL SURVEY.

NEWBERRY, J. S., and others. Geology and palaeontology. Ohio Geol. Survey, vol. 3, 1878, 958 pp.

ORTON, EDWARD, and others. Economic geology. Ohio Geol. Survey, vol. 5, 1884, 1124 pp.

BOWNOCKER, J. A., LORD, N. W., and SOMERMEIER, E. E. Coal. Ohio Geol. Survey, ser. 4, Bull. 9, 1908, 342 pp.

DACHNOWSKI, ALFRED. Peat deposits. Ohio Geol. Survey, ser. 4, Bull. 16, 1912, 424 pp.

STOUT, WILBUR. Geology of southern Ohio. Ohio Geol. Survey, ser. 4, Bull. 20, 1916, 723, pp.

STOUT, WILBUR. Geology of Muskingum County. Ohio Geol. Survey, ser. 4, Bull. 21, 1918, 351 pp.

BUREAU OF MINES.

HOLMES, J. A., STANTON, F. M., FIELDNER, A. C., and SANFORD, SAMUEL. Analyses of coals in the United States. Bull. 22, Bureau of Mines, 1913, 321 pp.

FIELDNER, ARNO C., SMITH, HOWARD I., FAY, ALBERT H., and SANFORD, SAMUEL. Analyses of mine and car samples of coal collected in the fiscal years 1911 to 1913. Bull. 85, Bureau of Mines, 1914, 444 pp.

FIELDNER, ARNO C., SMITH, HOWARD I., PAUL, J. W., and SANFORD, SAMUEL. Analyses of mine and car samples of coal collected in the years 1913 to 1916. Bull. 123, Bureau of Mines, 1918, 478 pp.

FIELDNER, ARNO C., SELVIG, WALTER A., and PAUL, J. W. Analyses of mine and car samples of coal collected in the fiscal years 1916 to 1919. Bull. 193, Bureau of Mines, 391 pp.